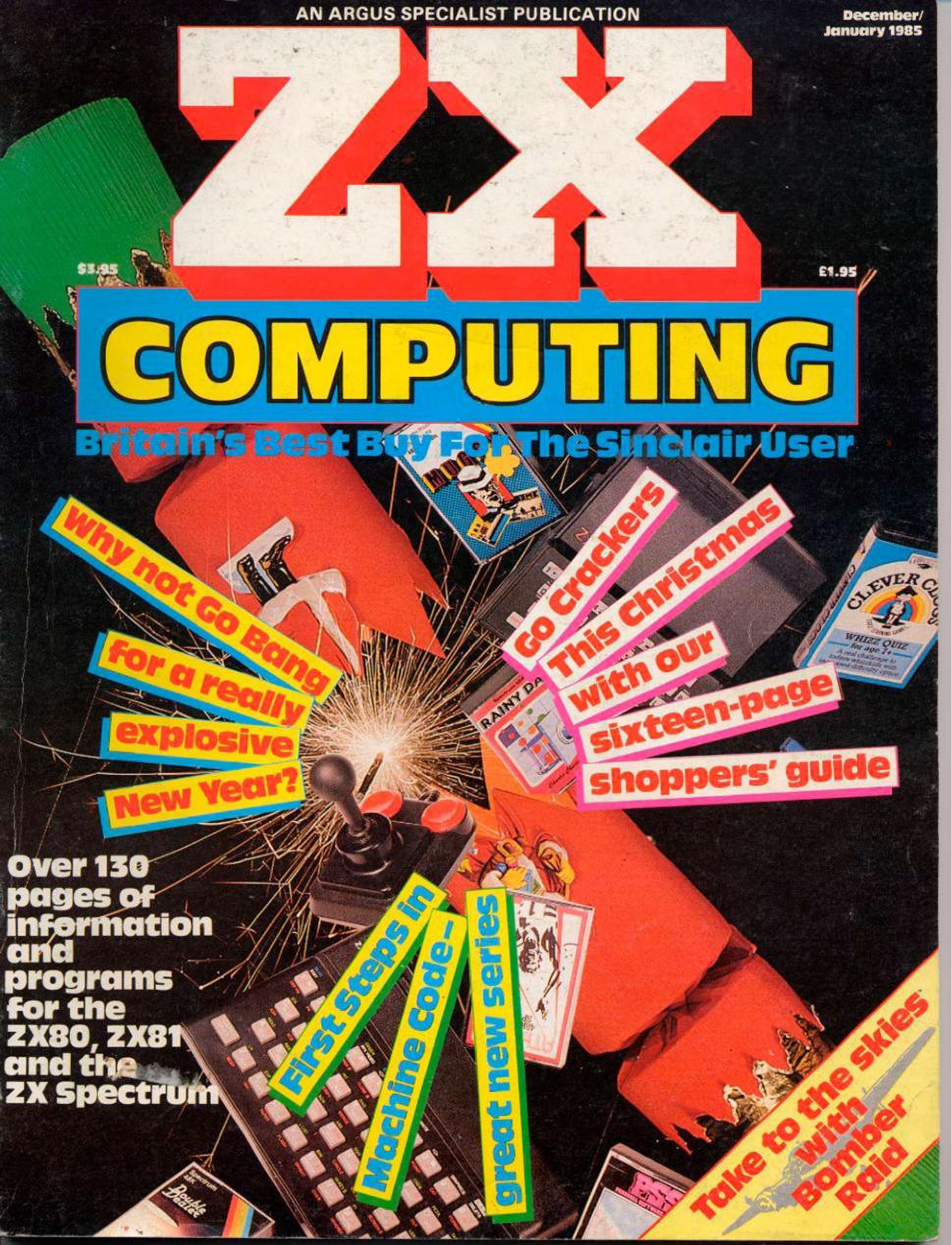
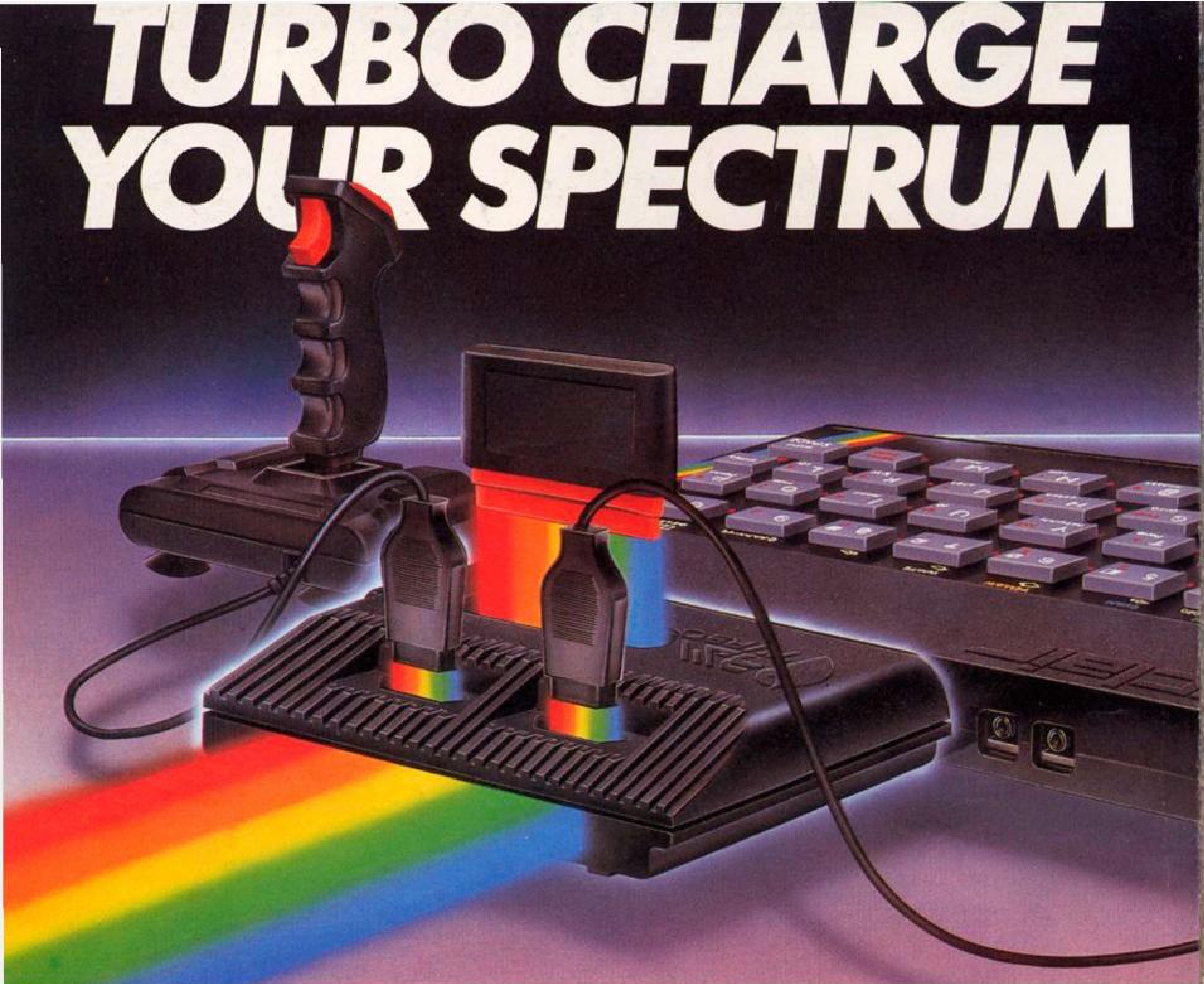


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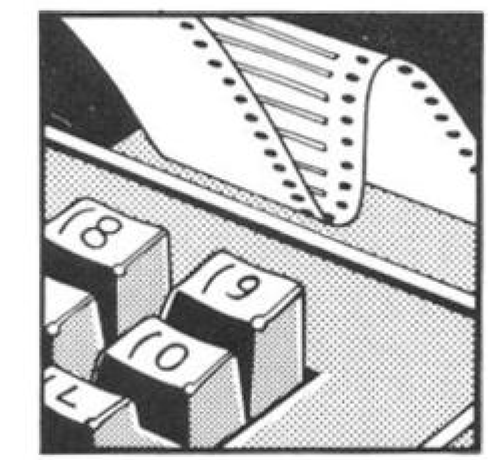
ASP FIGHTS SOFTWARE PIRACY

Much has been said and written in condemnation of software piracy but few have taken a positive stand against it. ASP is among those few that have taken action to help curb the grave problem of home copying of commercial software.

ASP has already taken steps to eliminate advertisements in our magazines which relate to tape duplication for piracy purposes. While it is appreciated that individuals may take 'back-up' copies of their own programs, it should be noted that it is *ILLEGAL* to copy commercially available software for other than personal use.

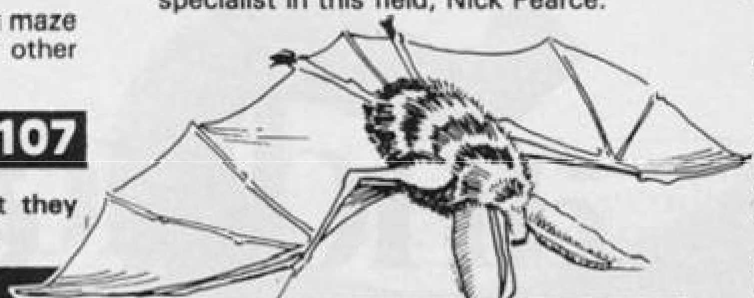
Software piracy is costing the software industry huge sums of money which is detrimental to the future development of the industry. It is in everybody's interests to dramatically reduce the level of software piracy primarily because firms need funds raised from software sales to plough back into research and development of new products. This means that the standard of software products can only improve.

ASP hopes our action will help combat this serious problem in order to maintain and improve the high standards of the UK software industry. We are asking *you* to do the same by refraining from duplicating or copying commercially available software for anything other than personal use.



PUTING

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All submitted material should be typed if possible; handwritten work will be considered, but please use your neatest handwriting. Any programs submitted should be listed, a cassette of your program alone will not be considered. All programs must come complete with a full explanation of the operation and, where relevant, the structure; Spectrum programs should be accompanied with a cassette of the program as well as the listing.

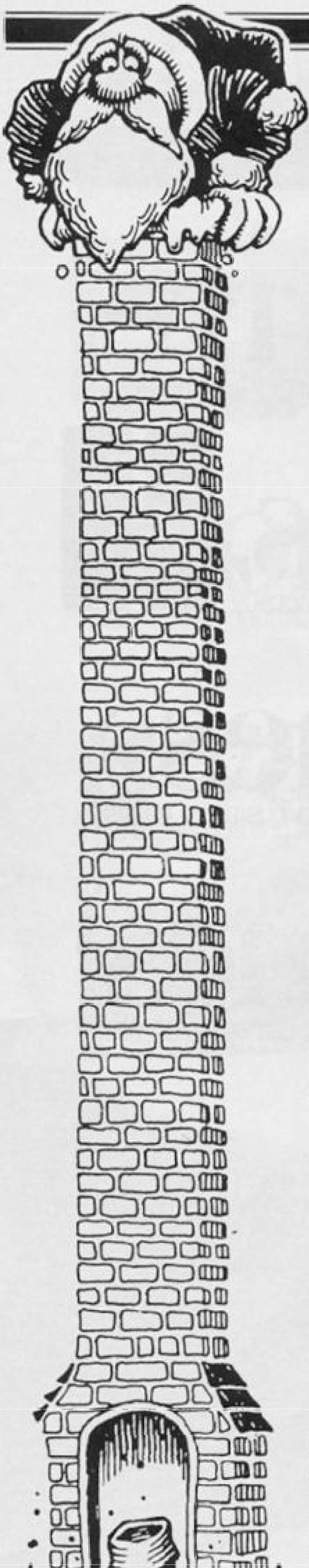
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WELCOME

Dear Mum,
How are you? All is well here and the cat has almost recovered. I think he must have mistaken the mains lead from the computer for a snake when he bit it. Still, apart from staying at least ten feet from the machine and a tendancy for his fur to curl, he seems to be OK.

Remember Jim? He wrote his own computer program to work out his tax returns, a very clever bit of programming. Unfortunately, a power fluctuation caused the thing to add a few noughts to the final total. As he couldn't pay £53,899.00 Her Majesty's inspectors were not impressed. Anyway he's only got another 8 months to do and with time off for good behaviour he should be out soon.

Dick continues to have bad luck. Last time I wrote I told you about how he had rigged up all his electrical equipment to his Spectrum and by using a voice recognition unit controlled his whole home speech. The trouble was that it wasn't too accurate at recognising the words and when another voice was also talking it really got confused. There's something weird about holding a conversation with lights, TV, kettle and other appliances flicking on and off. He eventually added a voice activated door lock. Not only did the burglars take all his goods, but their conversation activated the video which has "Towering Inferno" ready to play. Dick reckons that someone shouting FIRE activated the electric fire on which he'd left his last printout. Still, the fire brigade managed to salvage the computer and the tape recorder which had also been activated. The police are getting suspects to say "We'll leave that damned thing, they're two a penny" to get a voice print match.

A bit of excitement recently: Spit Slime, the old punk singer with the Darned moved into the area. He rounded up twenty volunteers by threatening them with money, and on the count of three all had to press enter. there was always someone who managed to get out of time, and as the evening wore on and the booze wore down the timing got more and more inaccurate. He gave up eventually and designed a huge device which consisted of twenty pulleys and rope and weights suspended over each enter key. He called me round to see his first attempt.

After loading in twenty programs and setting RUN, he held the master rope and gently lowered the weights. *It was **fantastic**!* Twenty BEEPs all in perfect time. Only one note so far, 'C', but all at the same time, and now all he has to do is write the tune and program it. He also has to buy twenty more Spectrums as he was so excited that he let go of the rope and, y'know, those keyboards aren't very strong.

Oh, by the way, Bill's just got divorced. He has to pay a fair bit of maintenance and £500.00 pounds to British Telecom, it seems his modem malfunctioned one day and failed to disconnect his phone link. He's not too unhappy though, he got custody of the ZX81.

So I must go, I hope you don't mind me telling you all about computers in my letters, I know you're not really interested, but all my computer friends only want to talk about **THEIR** business elsewhere when I meet them.

Love Ray.

1st Anniversary

Well this issue marks the end of a full year sitting in the editor's chair. I've had problems I never dreamed of, been frustrated and annoyed but over all I've enjoyed every minute.

Thanks to all of you who have written with praise, criticisms, problems or just to say hello. I do my best to reply but somethings take a while to find out, sometimes time is just not available and an answer may take a couple of weeks.

I have met and introduced to you some characters who I find interesting (and judging from your mail do so many of you; I've written to and spoken to hundreds of people — readers and manufacturers — who have given me a great deal of help, and my thanks goes to them also.

I look forward into the new year with excitement and enthusiasm. I hope to continue my custody of **YOUR** magazine, *ZX Computing*, and promise to maintain my wholehearted dedication to producing a varied and comprehensive publication.

And to each and every one of you, I wish a very happy Xmas — and a *Sinclair* new year!

Contributions

We are always on the lookout for good programs and articles for future issues of *ZX Computing,* and where better to look than to our own readers. If, when reading through the magazine you think you can write programs as well, or better than, our present contributors, then let's hear from you.

All contributions are, of course, paid for at very competitive rates. So if you've got your eye on a new ZX add-on or you'd just like to supplement your pocket money, get writing! It is vital, though, that all the programs you send us are totally original, and not 'borrowed' or 'adapted' from other magazines or books. (When Tim Hartnell was sitting in the Editor's chair, he even recieved 'original' contributions he himself had written for his own books!)

Any kind of program (business, domestic, educational, or just fun) will be welcomed which use ZX BASIC in clever and efficient ways, or those which employ certain routines which can be re-used on other programs.

Program listings are vital, along with a clear explanation of how the program is constructed, what it does and what the user can expect to see once the program is RUN (a screen dump is particularly valuable in this respect). When submitting Spectrum programs, it is very important to remember to enclose a cassette of the program as well as the listing, as this will allow us to check the program before publication.



In praise of the EP44

Dear Ray,
Just a note to share a discovery. I have ZX-81, TS-1500 (a 16K ZX81 in "Spectrum" clothing), and the TS-2068, a Spectrum with new keyboard and addition features and ROM. After getting a Tasword II word processor, I decided I wanted more than my 2040 Timex printer. . . (like the Alphacom 32 reviewed in *ZX Computing*).

In the USA, a discount-priced printer in the $200 class will be a dot-matrix without descenders. This is about the quality I get with the 2040 printer and software to print upper and lower case so it is not very exciting. The $300 class dot-matrix has descenders but does not produce "correspondence" quality like the $600 on up printers.

In reading about the state-of-the-art dot matrix printers I found that they have 24 × 18 dot pattern for letter resolution and use a thermal ribbon to burn the ink on the paper. The $1500 Fujitsu is an example of this type.

Now I have an EP-20 typewriter by **Brother** and it has the no descender, 5 × 7 dot matrix. . . so I ignored the computer adaptable EP-22. When the new EP-44 was announced I had heard it would be better, but assumed it would probably have descenders but wouldn't be "correspondence" quality. BOY WAS I WRONG!!!
Bob Harvard
California

A different cursor

Dear *ZX Computing,*
I have a tip for any program which uses INPUTs. It is that you can create your own cursor by defining the graphics character at USR "a", and then POKEing 23617,166. Here is an example of how to use it:

```
10 FOR N=0 TO 7: READ A:
   POKE USR "A"+N,A:
   NEXT N
20 POKE 23617,166
30 INPUT LINE A$
40 PRINT A$: GOTO30: DATA
   0, 96, 32, 32, 66, 126,
   124,0
```

You do not have to limit yourself to the "a" character. You can use any UDG with a code that is divisible by 4 i.e. A,E,I,M,Q and U. To obtain these, POKE the system variable with 166, 168, 170, 172, 174 and 176 respectively. You can also use C,G,K,O and S, but as soon as a key is pressed the cursor will change back to the character with a code of two less. I hope this will be of use and interest to your readers.
Yours faithfully,
Stephen Jennings (age 15)

Different decimals

Dear *ZX Computing*
Spectrum users who find it tiring to have to press both the shift symbol and letter M keys every time they want to key in the decimal point when entering numeric data, will find this subroutine helpful.

```
10 REM PRESS KEY M FOR DECIMAL POINT
20 INPUT LINE A$
30 GO SUB 1000
....
....
1000 FOR J=1 TO LEN A$
1010 IF A$(J)="M" OR A$(J)="m" THEN LET A$(J)="."
1020 NEXT J
1030 LET A=VAL A$
1040 RETURN
```

Listing for Different Decimals

The user would enter letter "M" in place of decimal point regardless of whether the computer is in C or L mode. In line 20, LINE suppresses the string quotes and line 1030 converts the string variable to a numeric.
Yours sincerely,
Douglas Marko Yobe
Zimbabwe

Not logical

Dear *ZX Computing.*
Re "Logical Expressions" article in the August/Septembr issue, there are a few interesting points that I would like to mention. Firstly, in some of the examples given, I think that the use of logical expressions is not always advantageous. For example in Figure 1 where LET L=(A>B) is suggested, I often find that the expression LET L=SGN(A-B) is more useful since this also accounts for A=B, which the former doesn't giving A>B, L=1 ; A=B, L=0 ; A<B, L=−1.

Secondly, logical expressions and their derivatives can often lead to very abstract functions and can thereafter be difficult to decipher when searching for bugs, etc. So it is better that the program lines are written out in full without complex logic, and only when you are completely satisfied with your work, then you can go through the program substituting the relevant lines. Having said this, there are a few further simplifying abstractions that can be noted from the article: (i) exchange line 310 for,

```
310 LET X=X + (INKEY$ =
"8" AND X=30) − (INKEY$ =
"5" AND X=0
```

(this takes less memory using ANDs instead of multipliers). (ii) exchange line 220 for,

```
220 PRINT CHR$ (27 +128 *
NOT A)
```

which gives the same effect, ie.



if A=0 then 128 will be added to the 27, if A≠0 then 128 won't be added to the 27. (iii) develop line 250 as follows,

```
250 LETQ = 21 * (1-L) +
           (Q-1) * L
         = (21-21 * L) +
           (Q * L-L)
         = 21-22 * L +
           Q * L
         = 21 + L * (Q-22)
           (much shorter than
           the orig.)
```

From this, a simple lesson may be learned: wherever logic expressions are not used, rarely need a variable appear in the same line twice, (as L did in the original).

Lastly, a few additions: (iv) to simulate XOR (or EOR), used,

ABS(NOT x — NOT y)

where x and y are logical expressions. This expression will equal 1 when either x is true or when y is true, but 0 when both are true or neither are true.

(v). The use of the double negative, ie. NOT NOT x, to convert any number to a 1 or 0. (Incidentally this is the same as SGN ABS X and ABS SGN X, useful inside logic combinations) is shorter than (X≠0).

(vi). Note the priority ratings of the three main functions, AND 3, OR 2, NOT 4, (see P.155 in the Spectrum manual).

Although I suspect that some of these were originally deliberate for the sake of understandability, I hope this letter has been helpful,

Yours faithfully,
Stephen E. Smith



Tandy paper

Dears Sirs,

I had been looking for a cheap and reasonable PRINTER, and I bought an ALPHACOM 32 after reading your favourable review of it in *ZX Computing* Feb/March issue. Ray Elder said, correctly, that the blue print didn't copy well enough for the magazine.

Initially, I had some difficulty getting the correct paper, and tried a roll of the paper the local TANDY shop had for their TP-10 printer, which explains why I have sent you two copies of the same letter.

The Tandy paper is about ¼ inch narrower, but it runs perfectly.

James D. Gilmour

Thanks James and all the other readers who've sent me this advice, I'm OK with Spectrum listings, it's just the ZX81 ones. However I've tried using this combination for one or two progs. in this issue, I'll see what the response is! — Ray.



Faster shuffling

Dear *ZX Computing*

In Bertil Forss' interesting Bridge program (Aug/Sept 1984) the 4 hands are chosen by simulating the real-life method of shuffling/dealing/sorting. A routine for doing this in a completely different way is given below; no sorting is needed, and the routine takes about half the time of Forss' routine.

P$ represents the pack in order: AS(pades)(, KS, QS,..., 2Clubs. To choose the 1st hand, AS is considered and is, or is not, picked for the 1st hand — with the right probability; then KS is considered and so on until 13 cards have been picked; depending on the random choice, the search could go as far as 2C. Then the 2nd and 3rd hands are picked in the same way, beginning with the highest card of the 39 or 26 cards left in the pack. Finally, the 4th hand is the 13 cards left. The array H$ (4,13) stores the 4 hands.

The right probability is achieved by Line 130, where N is the number of cards still to be picked for the current hand, and Q is the number of cards still to be considered in the residual pack. Thus, to begin with, Q=51 and N=13; if P$(1) is picked, then P$(2) is considered with Q=51 and N=12; but if P$(1) is not picked, then Q=51, as before, but N remains at 13. The 2nd hand begins with Q=39, N=13 and the 3rd hand with Q=26, N=13.

```
1 REM PICKING 4 BRIDGE
  HANDS
10 DIM P$(52)
20 DIM H$(4,13)
30 FOR N=1 TO 52
40 LET P$(N)=CHR$
   (52-N)
50 NEXT N
60 FOR M=1 TO 3
70 LET Q$=""
80 LET C=0
90 LET Q=13 * (5-M) + 1
100 FOR N=13 TO 1 STEP
    -1
110 LET C=C+1
120 LET Q=Q-1
130 IF RND * Q   =N THEN
    GOTO 110
140 LET Q$ =Q$ +P$(C)
150 LET P$ =P$(TO C-1)
    +P$(C+1 TO)
160 LET C=C-1
170 NEXT N
180 LET H$(M)=Q$
190 NEXT M
200 LET H$(4)=P$
```

Yours Sincerely
W E Thomson

A readable renumber

Dear Sir,

Re: RENUM — Aug/Sept 1984.

I read with interest the above short article. I enclose a listing of my own renumber routine which I have been using for some time and which is shorter and, I think, easier to understand than 'Renum'.

A short Basic program can easily be devised to enter the line number to be assigned first on renumbering, poking the low byte to 16515 and the high byte to 16516. The increment steps can be altered by poking a value to 16524. Start the program by Rand USR 16514.

Yours sincerely,
John Schofield

4082	010000	LD BC,0000	set BC to first new line number required
	217D40	LD HL,407D	set HL to start of Basic area
4088	79	LD A,C	get low byte of line number
	C60A	ADD A,0A	increment it
	4F	LD C,A	store it back
	78	LD A,B	get high byte of line number
	CE00	ADC A,00	add in any carry bit
	47	LD B,A	store it back
	70	LD(HL),B	poke new line number
	23	INC HL	
	71	LD(HL), C	
	23	INC HI	
	5E	LD E,(HL)	get line length
	23	INC HL	
	56	LD D,(HL)	
	19	ADD HL,DE	find end of line
	23	INC HL	find start of next line
	7E	LD A,(HL)	see if the character there is
	FE76	CP 76	a newline character — is so then
	C8	RET Z	start of Display file reached so all done
	18E9	JR 4088	else loop around for next line

John Schofield's renumber routine

Corrections for Oct/Nov

Just two 'itsy-bitsy', miniscule, minor and relatively insignificant (*Get on with it — Ed.*) errors to report for the October/November issue. David Webber's 'Equations' program from the 1K Corral of that issue (page 130) contained an error in line 3. This line reads:

3 LET M = 0

whereas it should have read:

3 LET N = 0

The COMPAC program which appeared in the October/November issue, also contained a couple of bugs. Firstly, the trigger characters have disappeared from the last line ie there should be a line of thirty-two grphic shift sixes (CHR$ 131) after the lettering in line 9999. Without these, the top tunnels will not work (although the bottom and side tunnels are OK).

Secondly, in the hex-loader there should be five REM lines, as specified in the text, and the last line of the hex-dump is unnecessary but harmless.

After the customizing heading, as described in the text, A = 136 should read K = 136, and in the next paragraph there should be a 'less-than' symbol before the number four.

The error in line 9999 can be taken as further proof that Murphy's Law actually works ie, having purposely labelled it with 'this line is ESSENTIAL', it was almost certainly the only line out of the main program to get nobbled!


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3D Bowling



The last time I went bowling I got my finger stuck in a hole! No chance of that with John Wilson's game.

3DZX81 bowling is an excellent simulation of a Ten Pin bowling alley, with a good perspective view. Your Spectrum even keeps score and puts a stop to cheating!

When run, the program sets up a 3D representation of the bowling alley with the frame indicator and a flashing "spin factor". The ball's trajectory is determined by the spin factor, a '+' factor will give the ball a curve to the right, a '−' factor will curve left and a zero factor causes the ball to run straight down the alley.

Your score sheet is shown at the bottom of the screen and is automatically filled in as the game progresses. Strikes and spares are correctly identified and represented by x and / respectively.

To control your ball use the keys 5 and 8 to position it across the alley and then press B to release it, trying to catch the spin factor at the required '+', 'o' or '−' position. This is where the skill comes in!

Once you have entered and de-bugged the game, SAVE it by using GOTO 1480 and it will then RUN automatically on reloading.

This *striking* game will **NOT** spare you any frustration!

```
 30 LET F=0
 40 GOSUB 1350
 50 LET H=10
 60 LET N=1
 70 GOSUB 110
 80 IF F>0 THEN LET F=F+1
 90 GOTO 290
100 REM **NEW FRAME**
110 FOR Z=1 TO 25
120 NEXT Z
130 IF F<>29 THEN PRINT AT 1,0;
"FRAME ";INT ((F+4)/3)
140 PRINT AT 0,12;"▩ ▩ ▩ ▩"
150 PRINT TAB 12;"▒▩▒▩▒▩▒"
160 PRINT TAB 13;"▒▩▒▩▒"
170 PRINT TAB 14;"▒▩▒"
180 PRINT TAB 14;CHR$ 10;"▒";CH
R$ 10
190 PRINT TAB 15;"▒"
200 LET B=1
210 FOR A=5 TO 17 STEP 2
220 PRINT AT A,11-B;" ▌";TAB 19+
B;"▌ "
230 PRINT AT A+1,11-B;"▌ ";TAB 1
9+B;" ▌"
240 LET B=B+1
250 NEXT A
260 IF F=29 THEN GOTO 1390
270 RETURN
```

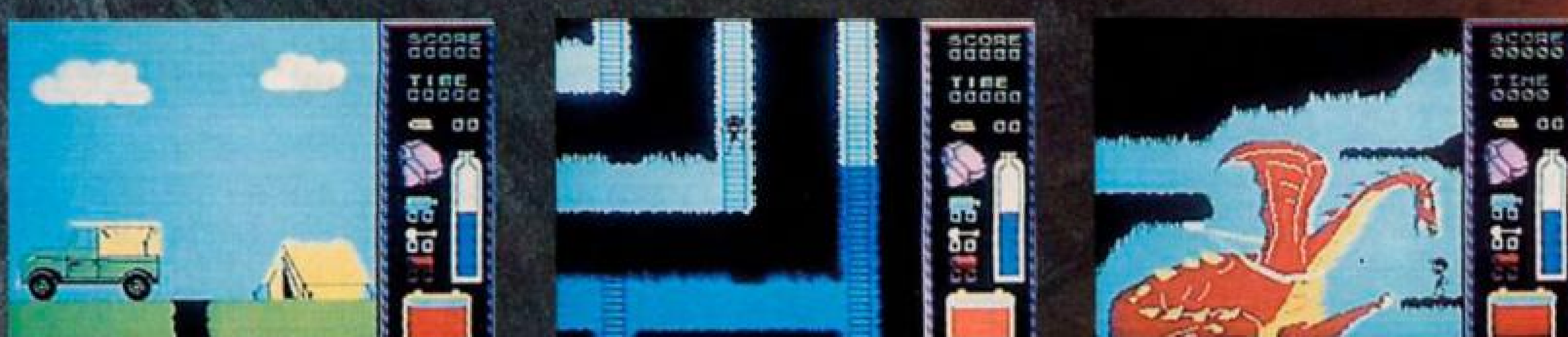
```
280 REM
**AIMS BALL**
290 PRINT AT 18,B;"O"
300 GOSUB 560
310 IF INKEY$="" THEN GOTO 300
320 LET D=B-(INKEY$="5")+(INKEY
$="8")
330 IF D<5 THEN LET D=5
340 IF D>25 THEN LET D=25
350 PRINT AT 18,B;" "
360 LET B=D
370 GOTO 290
380 LET N=1
390 REM **BOWLS BALL**
400 FOR C=18 TO 1 STEP -1
410 IF C=15 THEN LET B=B+S
420 PRINT AT C,B;"O"
430 PRINT AT C,B;" "
440 IF C=5 AND B=15 THEN GOTO 6
80
```

```
 450 IF C=4 AND B=14 OR C=4 AND
B=16 THEN GOTO 810
 460 IF C=3 AND B=13 OR C=3 AND
B=17 THEN GOTO 980
 470 NEXT C
 480 IF B=12 OR B=18 THEN GOTO 1
130
 490 LET F=F+1
 500 PRINT AT 20,F;0
 510 IF N=2 THEN GOTO 50
 520 LET H=10-H
 530 LET N=2
 540 GOTO 290
 550 REM **SPIN FACTOR**
 560 PRINT AT 3,25;"-  "
 570 PRINT AT 1,21;"SPIN FACTOR"
 580 LET S=-1
 590 IF INKEY$="B" THEN GOTO 400
 600 PRINT AT 3,25;"  +"
 610 LET S=1
 620 IF INKEY$="B" THEN GOTO 400
 630 PRINT AT 3,25;" 0 "
 640 LET S=0
 650 IF INKEY$="B" THEN GOTO 400
 660 RETURN
 670 REM **REMOVES PINS HIT**
 680 PRINT AT 0,12;"       "
 690 PRINT AT 1,12;"       "
 700 PRINT AT 2,13;"     "
 710 PRINT AT 3,13;"    "
 720 PRINT AT 4,14;"   "
 730 PRINT AT 5,15;" "
 740 LET F=F+1
 750 IF N=1 THEN GOTO 780
 760 PRINT AT 20,F;"/"
 770 GOTO 50
 780 PRINT AT 20,F;" X"
 790 LET F=F+1
 800 GOTO 50
 810 IF B=16 THEN GOTO 870
 820 PRINT AT 0,12;"    "
 830 PRINT AT 1,12;"    "
 840 PRINT AT 2,13;"  "
 850 PRINT AT 3,14;" "
 860 GOTO 910
 870 PRINT AT 0,14;"    "
 880 PRINT AT 1,14;"    "
 890 PRINT AT 2,15;"  "
 900 PRINT AT 3,16;" "
 910 LET F=F+1
 920 IF N=2 THEN LET H=10-H
 930 GOSUB 1220
 940 PRINT AT 20,F;H
 950 IF N=2 THEN GOTO 50
 960 LET N=2
 970 GOTO 290
 980 IF B=17 THEN GOTO 1030
 990 PRINT AT 0,12;"   "
1000 PRINT AT 1,12;"   "
1010 PRINT AT 2,13;" "
1020 GOTO 1060
1030 PRINT AT 0,16;"   "
1040 PRINT AT 1,16;"   "
1050 PRINT AT 2,17;" "
1060 IF N=2 THEN LET H=10-H
1070 GOSUB 1220
1080 LET F=F+1
1090 PRINT AT 20,F;H
1100 IF N=2 THEN GOTO 50
1110 LET N=2
1120 GOTO 290
1130 PRINT AT 0,B;" "
1140 IF N=2 THEN LET H=10-H
1150 GOSUB 1220
1160 LET F=F+1
1170 PRINT AT 20,F;H
1180 IF N=2 THEN GOTO 50
1190 LET N=2
1200 GOTO 290
1210 REM **COUNTS PINS HIT"
1220 LET P=PEEK 16396+256*PEEK 1
6397
1230 FOR G=P+13 TO P+19
1240 IF PEEK G=180 THEN LET H=H-
1
1250 NEXT G
1260 FOR G=P+47 TO P+51
1270 IF PEEK G=180 THEN LET H=H-
1
1280 NEXT G
1290 FOR G=P+81 TO P+83
1300 IF PEEK G=180 THEN LET H=H-
1
1310 NEXT G
1320 IF PEEK (P+115)=180 THEN LE
T H=H-1
1330 RETURN
1340 REM **PRINTS SCORE SHEET**
1350 PRINT AT 19,0;"▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄
▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄"+CHR$ 4
1360 PRINT AT 21,0;"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀"+CHR$ 1
1370 PRINT AT 20,0;"▌  ▌  ▌  ▌
▌  ▌  ▌  ▌  ▌  ▌  ▌"
1380 RETURN
1390 PRINT AT 17,10;"END OF GAME
"
1400 FOR Z=1 TO 100
1410 NEXT Z
1420 CLS
1430 PRINT AT 10,2;"PRESS ANY KE
Y TO PLAY AGAIN"
1440 IF INKEY$="" THEN GOTO 1440

1450 CLS
1460 GOTO 30
1470 SAVE "3D BOWLIN▣"
1480 RUN
```

Death pit takes you deep down
to a tangled labyrinth of dank tunnels.
Struggle through spider infested corridors,
past bats and mutant life forms.
Dig through the rockfalls
(you remembered a spade?)
and bravely plunge into the dark water
of flooded caverns.

The tension grips,
your pit light fades
and before you waits the Guardian.
After this last gruesome trial
will you still have strength enough
to return?

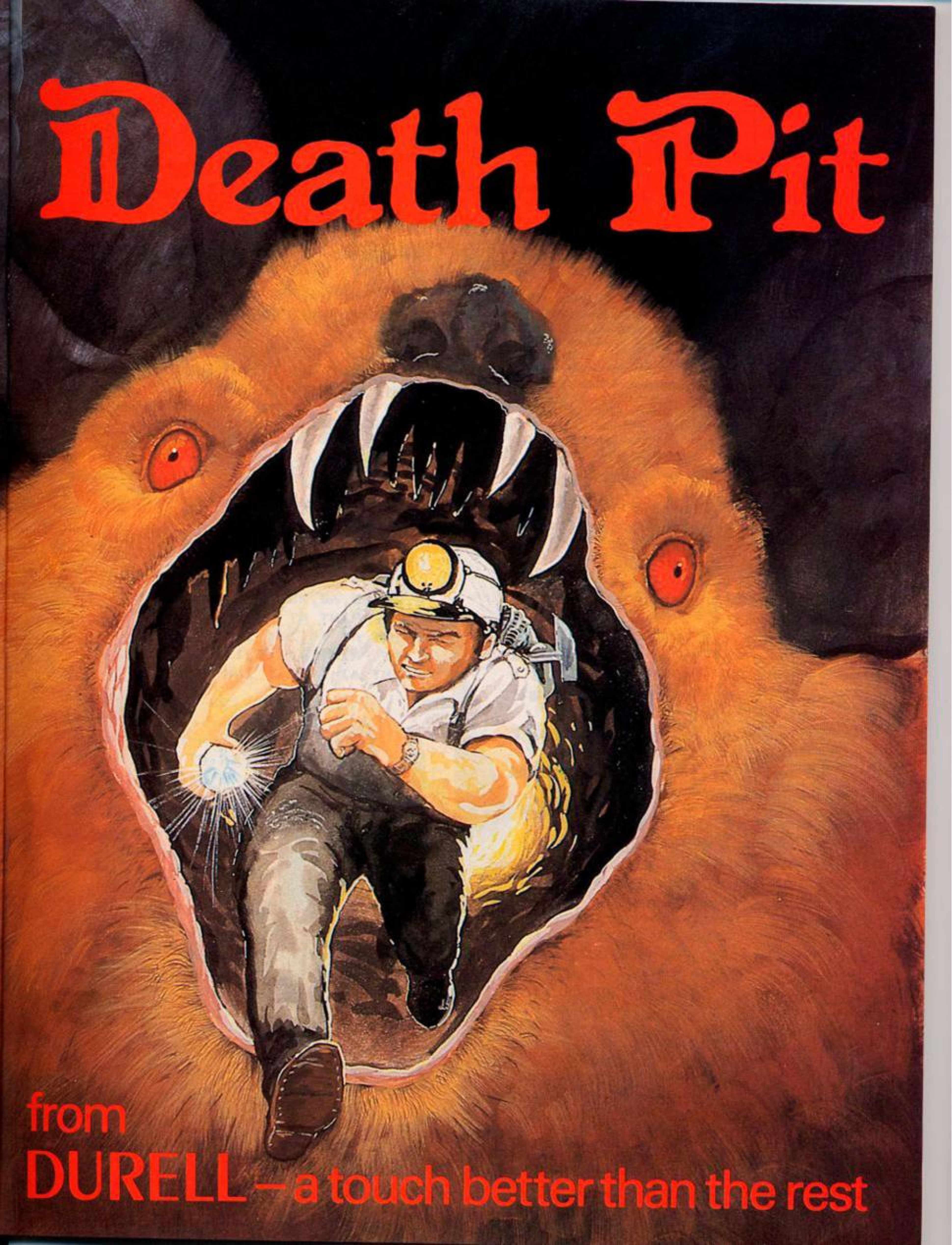


screen shots from Spectrum 48K.

Sounds tricky? – well it is . . . . . and we haven't
told you half of it.

DEATH PIT – another high quality machine-code
game from Durell.
Available now from most retail outlets for the –
48K Spectrum, BBC, Commodore 64, and Amstrad

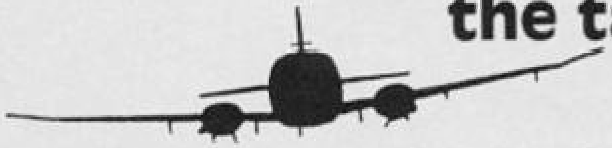
DURELL sales dept. Castle Lodge,
Castle Green, Taunton, Somerset TA1 4AB



Death Pit
from
DURELL – a touch better than the rest

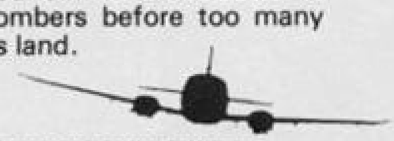
Bomber raid

Defend your city from the bombers — the task set by W Simister of Haverfordwest



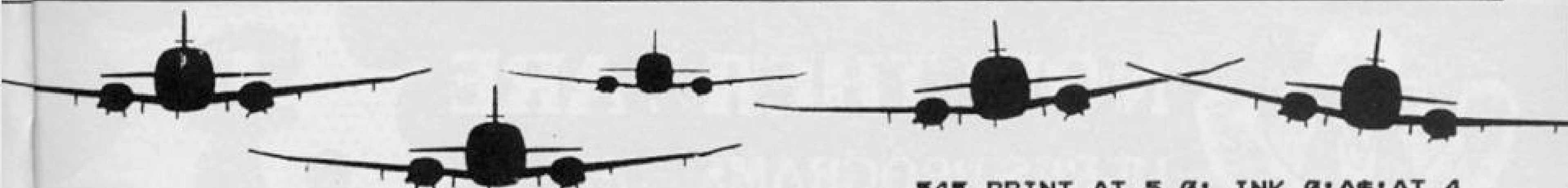

Written for the 16/48K Spectrum, this program shows an extensive use of USR graphics. These help to fill the screen, and make for a full and colourful game. The game is set during the second world war, when so many cities were bombed. Your city is defended by a balloon barrage, and by anti-aircraft guns.

You are in charge of one gun battery, and have 40 shots; firing with "f" when a bomber is overhead. Each strike is shown by an explosion of the bomber, and it disappears. When you have used 5 shots a bomb lands on the city, and a building starts to burn. After another 10 shots a second bomb lands, and another after a further 10 shots. It is your aim to shoot down all the bombers before too many bombs land.



```
  1 REM ***********************
        *Underlined characters*
        *are entered in       *
        *GRAPHICS mode.       *
        ***********************
  15 BORDER 3: PAPER 5: INK 1: C
LS
  5Ø REM Build City
  55 PRINT AT 12,Ø;"▌▌": PRINT A
T 13,Ø;"██.▌  █": PRINT AT 13,3
Ø;"█": PRINT AT 14,Ø;"█████ █."
: PRINT AT 14,27;"▌ ██"
  6Ø PRINT AT 15,Ø;"█████████ ▌
.": PRINT AT 15,25;"▟ █▄██"
  65 PRINT AT 16,Ø;"███████████
▄▄▄▄▄▄▄▄▄▄▄▄███████"
 12Ø FOR x=Ø TO 7: READ y: POKE
USR "G"+x,y: NEXT x
 125 FOR p=Ø TO 7: READ q: POKE
USR "H"+p,q: NEXT p
 13Ø DATA 178,142,113,77,178,142
,113,77,51,2Ø4,85,85,17Ø,17Ø,51,
2Ø4
 135 PRINT AT 17,Ø;"GHGHGGHGHGHH
GHGHGGHGHGHHGHGHGGHG"
 14Ø PRINT AT 18,Ø;"HGHGHGGHGHGH
HGHGHGHG GHGGHGHGHHG"
 145 PRINT AT 19,Ø;"GHHGHGGHGHHG
HGGHGHH    HGGHGHGHHG"
 15Ø PRINT AT 2Ø,Ø;"HGHGGHGHGHHG
HGHGGHGHGHHGHGHGGHGH"
 155 PRINT AT 21,Ø;"GHGHHGHGGHGH
GHHGHGHGGHGHGHHGHGHG"
 3ØØ REM Gun firing
 3Ø5 FOR x=Ø TO 7: READ y: POKE
USR "D"+x,y: NEXT x
 31Ø FOR p=Ø TO 7: READ q: POKE
USR "E"+p,q: NEXT p
 315 DATA 24,24,24,24,24,24,24,2
4,24,6Ø,6Ø,255,255,6Ø,6Ø,6Ø
 32Ø PRINT AT 18,2Ø; INK Ø;"D":
PRINT AT 19,2Ø; INK Ø;"E"
 325 PRINT AT 19,19; INK Ø;"▌":
PRINT AT 19,21; INK Ø;"▌"
```



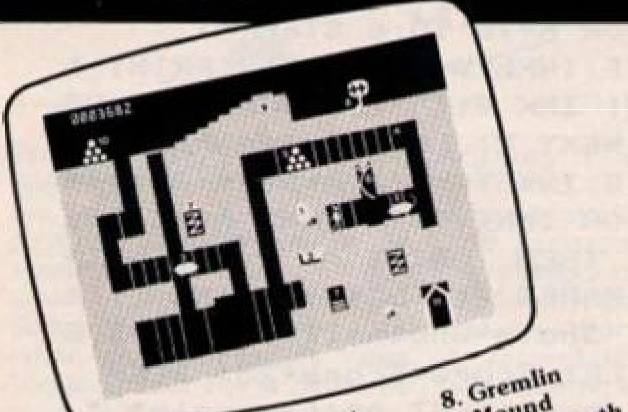


```
 33Ø FOR x=Ø TO 7: READ y: POKE
USR "M"+x,y: NEXT x
 335 FOR p=Ø TO 7: READ q: POKE
USR "N"+p,q: NEXT p
 34Ø DATA Ø,193,239,127,127,127,
239,193,Ø,24Ø,252,254,255,254,25
2,24Ø
 345 PRINT AT 6,4; INK 1;"MN": P
RINT AT 6,22; INK 1;"MN": PRINT
AT 7,16; INK 1;"MN": PRINT AT 8,
9; INK 1;"MN": PRINT AT 8,28; IN
K 1;"MN"
 35Ø INK 1: PLOT 56,56: DRAW -16
,64: PLOT 96,48: DRAW -16,56: PL
OT 152,44: DRAW -16,68: PLOT 2ØØ
,44: DRAW -16,76: PLOT 244,56: D
RAW -12,48
 4ØØ REM Bombers
 4Ø5 FOR x=Ø TO 7: READ y
 41Ø POKE USR "A"+x,y: NEXT x
 415 DATA Ø,Ø,16,33,255,124,32,6
4
 42Ø FOR x=Ø TO 7: READ y
 425 POKE USR "B"+x,y: NEXT x
 43Ø DATA 16,33,255,124,32,64,Ø,
Ø
 5ØØ LET Score=Ø
 5Ø5 FOR G=1 TO 2Ø: BEEP .ØØ8,G:
 NEXT G
 51Ø LET Shots=4Ø
 515 FOR H=5Ø TO 2Ø STEP -2: BEE
P .ØØ8,H: NEXT H
 52Ø LET A$="A B A     B A B     A
 B A    B A B"
 525 LET B$=A$
 53Ø LET Across=21
 533 FOR R=Ø TO 7: READ S: POKE
USR "O"+R,S: NEXT R
 54Ø DATA 36,165,165,9Ø,189,153,
255,255
 545 PRINT AT 5,Ø; INK Ø;A$;AT 4
,Ø;B$;AT 3,Ø;B$(3 TO  )+B$(1 TO
2): BEEP .ØØ8,55-Shots
 55Ø FOR H=16 TO 6 STEP -1
 555 IF INKEY$="f" THEN  PRINT A
T H,2Ø; INK Ø;"^": PRINT AT H,2Ø
;" ": NEXT H: LET Shots=Shots-1
 56Ø IF INKEY$="f" AND A$(Across
)="A" OR INKEY$="f" AND A$(Acros
s)="B" THEN  PRINT AT 5,2Ø; BRIG
HT 1; PAPER 7; FLASH 1; INK 2;"*
": LET Shots=Shots-1: BEEP .Ø5,S
hots: LET Score=Score+25: BEEP .
Ø5,5Ø-Shots: LET A$(Across)=" "
 565 IF INKEY$="f" AND B$(Across
)="B" OR INKEY$="f" AND B$(Acros
s)="A" THEN  PRINT AT 4,2Ø; BRIG
HT 1; PAPER 7; FLASH 1; INK 2;"*
": LET Shots=Shots-1: BEEP .Ø5,S
hots: LET Score=Score+5Ø: BEEP .
Ø5,5Ø-Shots: LET B$(Across)=" "
 57Ø PRINT AT 21,Ø; INK Ø; INVER
SE 1;"Score:    "; FLASH 1;Score;
 FLASH Ø;": Shots Left: "; FLASH
 1;Shots; FLASH Ø;"   "
 575 IF Shots Left<=35 THEN  PRI
NT AT 12,Ø; BRIGHT 1; PAPER 7; F
LASH 1; INK 2;"OOO": PRINT AT 12
,Ø;"   ": PRINT AT 13,Ø; BRIGHT
1; PAPER 7; FLASH 1; INK 2;"OOO"
: PRINT AT 13,Ø;"   ": PRINT AT
14,Ø; BRIGHT 1; PAPER 2; FLASH 1
; INK 7;"OOO"
 58Ø IF Shots Left<=25 THEN  PRI
NT AT 15,8; BRIGHT 1; PAPER 7; F
LASH 1; INK 2;"OOO": PRINT AT 15
,8;"   ": PRINT AT 16,8; BRIGHT
1; PAPER 7; FLASH 1; INK 2;"OOO"
: PRINT AT 14,8;" "
 585 IF Shots Left<=15 THEN  PRI
NT AT 15,26; BRIGHT 1; PAPER 7;
FLASH 1; INK 2;"OO": PRINT AT 15
,26;"  ": PRINT AT 16,26; BRIGHT
 1; PAPER 7; FLASH 1; INK 2;"OO"
: PRINT AT 14,27;" "
 59Ø IF Shots<1 THEN  PRINT AT 1
Ø,3;"THAT'S THE END OF THE GAME"
: STOP
 595 LET A$=A$(2 TO  )+A$(1)
 6ØØ LET B$=B$(3 TO  )+A$(1 TO 2
)
 6Ø5 GO TO 545
```

LOOK!

NOW THERE ARE 3

HI-RES PROGRAMS FOR THE 16K ZX-81



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You must excavate this precious metal – but can you survive the giant rats and that vicious Gremlin which will come to infest your mine? Can you trick the snakes into leaving their comfortable nests and destroy the rats for you? Can you keep the Gremlin at bay?

Riches await you – but so do the hazards!

ROCKET MAN

Get rich quick by collecting Diamonds that are simply lying there waiting for you!

Oh . . . I forgot to mention that there are one or two problems!

There is an expanse of shark infested water between you and the Diamonds and a strange breed of Bubble that seems hell bent on getting you in it! Somehow you must cross it . . . .

You have a Rocket Pack to help you (a Vulture on higher levels) but you must rush around the platforms and ladders collecting cans of fuel (legs of lamb with the Vulture) and cursing that weird Bubble. Once you have enough fuel then it's Chocks Away!

Oh . . . but don't run out of fuel on the way – otherwise it's . . . SPLASH!



ew-new-new-new-n



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A long time ago, in a galaxy far, far, away a terrible war took place between two hostile races. Any prisoners taken could not expect to live very long in the hands of their captors. Their only hope lay with a group of valiant warriors – the XTRICATORS – whose task it was to rescue fellow beings from the alien planet's surface. You are about to take on the role of such a warrior . . . .

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		TOTAL	

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Carol Quiz

Now the festive season is near, everywhere you go people are humming, whistling, or even singing Christmas carols. But how quickly do you recognise the tune? Here's your chance to find out. After an elaborate animated and entertaining title sequence (during which numerous variables are set so don't try to miss it out!) the machine will play a carol, using its much maligned but quite effective BEEP. All you have to do is recognise the tune and press the appropriate key. Easy? Not a lot! Here's the catch. The tune won't start playing at the beginning!

Low scores are best as the longer you take, the more penalties you collect. But don't make a mistake — that's an extra 15 points.

Typing in

The program makes use of the PRINT routine in machine code from your "Horizons" tape so to begin, LOAD "wall" from side B. When the program begins, BREAK, then NEW it. (Don't panic! The bytes you want are safe above RAMTOP.) Now type in and RUN the line given below, ENTERing the number from TABLE A, reading across the lines.

This sets up the user-defined graphics:

FOR f = USR "a" TO USR "u" + 7: INPUT i : POKE f,i : NEXT f

Now you are ready to type in the main program, but PLEASE read the notes which follow first!

The capital letters within quotes in lines 3, 9, 50, 110, 130, 170, 349 & 360 are user-defined graphics and must be entered in G Mode.

Some string variables are declared with colour control codes. ENTER these as follows:

Line 9, starting after LET x$ = " is entered as E MODE/CAPS SHIFT 4 /G MODE/I/E MODE/CAPS SHIFT 2 /G MODE/J/E MODE/CAPS SHIFT 4 /G MODE/H/"/ : /LET /y /$ = /" /G MODE/H /E MODE/CAPS SHIFT 2 /G MODE/J /E MODE/CAPS SHIFT 4 /G MODE/I/E MODE/CAPS SHIFT 0

Line 349, starting after LET a$ = "is entered first as E MODE 6. Now enter the following sequence four times: E MODE/CAPS SHIFT 2 / G *MODE* R P/E MODE/CAPS SHIFT 3 /G MODE K/.

End with E MODE/CAPS SHIFT 2 /G MODE R P/ " /:/LET /b/$ /= /" /G MODE/J/E MODE/ CAPS SHIFT 4 /G MODE/I/" /:/LET /c /$ /= /" /G MODE/H /E MODE/CAPS SHIFTS 2 /G MODE/J/E MODE 7 /E MODE/CAPS SHIFT 0

In the above lines don't type in the /signs. They are just there as spacers to separate the key presses.

SAVE all the parts of the program using **SAVE "carol" LINE 9998: SAVE "Cg" CODE USR "a",168: SAVE "cc" CODE 32256,300**

VERIFY with **VERIFY"": VERTIFY "" CODE: VERIFY ""CODE.**



When you LOAD the program back in from tape the main program will autorun and LOAD in the graphics and machine code before it starts. If you want to try it straight away just use RUN ENTER.

Interesting points

Rather than go through the program line by line I will highlight certain areas which may be of interest to readers to use in their own programs.

Firstly the problem of a 16K Spectrum having only about 9K of useable RAM. To fit the program in a number of "tricks" have been used. Holding the graphics and machine code separately, not as DATA within the program is a useful space-saver. Another good saver is declaring variables for often used numbers e.g. LET x=.1. These can be shortened even more e.g. LET o=NOT PI (NOT any number is 0) or LET q=VAL"15". VAL can be used for any number within the program but it should be remembered that all these space-savers slow down the program. The golden rule is use real numbers where you want speed, and variables where it doesn't matter. Two other points. If you declare variables early the program finds them faster, and variable letters (names are "expensive") can be reused with different values.

Now some specific points.

Line 1 — This is needed to jump over the subroutines in lines 2 to 5. These subroutines ar put here at the beginning so that they can be found quickly by the machine.

Line 2 — This subroutine is used to "scroll" the string set in line 170. The string consists of a line of spaces (z$), the Father Christmas graphics (f$) and the message (m$). Variable i sets inverse and j is the PRINT row. When called the subroutine slices the string into a length of 32 characters, starting at the left, and moving one to the right each loop This produces the right-to-left scrolling effect.

Line 3 — This is called within a loop from line 900, where z is set to 0. It produces the flashing stars around the score. The apparently illogical LET z=(z=0) is in fact a use of the machines logic! If z does equal zero then the statement within brackets is true. In logic terms this equals 1, so z=1. The next tie the subroutine is called z=1 so the bracketed statement is false. This is returned as 0, the new value for z. This "toggle" effect repeats itself. The value of z is used in the PRINT statement in another logical statements. 1 if true or 0 if false is added to INK 1 to give red or blue ink.

Line 5 — This sets up and calls the "Horizons" PRINT routine. Various values have to be POKEd in first. xx is pixels across, yy is pixels down, xs is letter height magnification factor, ys is letter width factor and p$ is the string to be PRINTed. If you want to know more about this routine WATCH THIS SPACE! There's an article in preparation.

Lines 9 & 50 — PRINTs the starry sky and the main title in "Gothic" script.

Line 90 — Assigns the variables for the music DATA This saves a lot of space in these lines (1000-5500).

Line 100 — Inverts the screen by PRINTing a line of 32 spaces 22 times down the screen. As OVER 1 is used nothing but INVERSE or later PAPER is altered. (INK or FLASH or BRIGHT would work just as well.)

Lines 110 & 130 — Demonstrates the use of animation and sound together. Note the variables in the DATA line. A great space saver, but not allowed on most computers. Aren't we lucky!

Line 175 — VALing the strings in the DATA lines is another way to saving bytes.

Line 349 — This line, awkward though it is to enter saves a good deal of space.

Line 360 — Produces the festive border to the score.

Line 900 — A number of interesting points here. (The flashing stars use subroutine 3 already described. Note the use of #0 to PRINT on row 23. The values for note length (x & y) are set first, then used in the DATA lines to save space. (Also when experimenting with the tempo it was easier to alter two values than all the DATA values!)

Lines 1000 to 5500 — At last the secret of getting quarts into pint pots is revealed. Numeric DATA takes up a tremendous amount of memory. Using variables reduces this dramatically. Apart from this space-saving there is another advantage in this system. If you choose your variable letters carefully (for crochet note length, dm for dotted minim etc., and A, E etc. for the note pitch with, for example FS for F sharp, BF for B flat and TC for top C) entering the DATA direct from the music is fast and easy for anyone having just a basic knowledge of musical notation.

```
   1 GO TO VAL "9"
   2 FOR n=1 TO LEN m$+1: PRINT AT j,0; INVERSE i;(z$+m$)(n TO n+31): BEEP .05,n: NEXT n: RETURN

   3 LET z=(z=0): PRINT AT 6,7; INK 2+(2 AND z=0);"QS";AT 7,7;"IU";AT 6,23;"QS";AT 7,23;"IU";AT 14,7;"QS";AT 15,7;"IU";AT 14,23;"QS";AT 15,23;"IU": RETURN
   5 LET xx=(256-8*xs*LEN p$)/2+p: LET i=23306: POKE i,xx: POKE i+1,yy: POKE i+2,xs: POKE i+3,ys: POKE i+4,8: LET i=i+4: LET w=LEN p$: FOR t=1 TO w: POKE i+t,CODE p$(t): NEXT t: POKE i+w+1,255: LET w=USR 32256: RETURN
   9 LET z$="                                ": LET o=NOT PI: LET m=SGN PI: LET d=m+m: INK VAL "7": BORDER d: PAPER m: CLS : FOR f=m TO VAL "100": PRINT AT RND*20,RND*30;"*": BEEP .01,RND*10+36: NEXT f:  LET a$="█  █": LET b$="█  █ █": LET x$="IJH": LET y$="HJI": PRINT AT m,VAL "6";"N███L";AT d,VAL "5";"N  █";AT INT PI,VAL "5";a$;AT VAL "4",VAL "5";a$;AT VAL "5",VAL "5";"█N██";AT VAL "6",VAL "5";a$;AT VAL "7",VAL "5";a$;AT VAL "8",VAL "5";"M  LN";AT VAL "9",VAL "6";"M███L": LET p$="arol": LET yy=VAL "24": LET xs=VAL "4": LET ys=VAL "8": LET p=VAL "32": GO SUB VAL "5"
  50 PRINT AT VAL "12",VAL "7";"N██Q";AT VAL "13",VAL "6";"N  █Q";AT VAL "14",VAL "6";b$;AT VAL "15",VAL "6";b$;AT VAL "16",VAL "6";"█N██ █";AT VAL "17",VAL "6";b$;AT VAL "18",VAL "6";b$;AT VAL "19",VAL "6";"M  L L";AT VAL "20",VAL "7";"M█████L": LET p$="uiz": LET yy=VAL "112": LET p=VAL "40": GO SUB VAL "5"
  90 PAUSE VAL "50": LET c=VAL ".5": LET q=VAL ".25": LET dm=c+m: LET dc=c+q: LET E=d+d: LET F=VAL "5": LET FS=VAL "6": LET G=fs+m: LET A=VAL "9": LET BF=a+m: LET B=a+d: LET TC=VAL "12": LET TD=tc+d: LET TE=td+d
 100 FOR n=m TO VAL "4": FOR i=o TO VAL "21": PRINT AT i,0; OVER 1; INVERSE 1;z$: NEXT i: NEXT n: FOR i=o TO VAL "21": PRINT AT i,0; OVER 1; PAPER 5;z$: NEXT i
 110 PAUSE VAL "50": PRINT AT VAL "10",d; PAPER VAL "5"; INK VAL
```

```
"6";"[redacted]": RESTORE VAL "130": FOR n=m
TO VAL "6": PRINT AT VAL "11",d;
PAPER VAL "5"; INK m;"E  "; INK
d;"G  "; INK m;"E  "; INK d;"G
"; INK m;"E  "; INK d;"G  "; IN
K m;"E  "; INK d;"G  "; INK m;"E
 "; INK d;"G": READ t,u: BEEP t
,u: PRINT AT VAL "11",d; PAPER V
AL "5"; INK m;" G"; INK d;"E
"; INK m;"G"; INK d;"E     "; INK
m;"G"; INK d;"E     "; INK m;"G"
; INK d;"E     "; INK m;"G"; INK
d;"E ": READ t,u: BEEP t,u: NEXT
n
 130 PRINT AT VAL "11",d; PAPER
VAL "5"; INK m;"E  "; INK d;"G
"; INK m;"E  "; INK d;"G  "; INK
m;"E  "; INK d;"G  "; INK m;"E
"; INK d;"G  "; INK m;"E  "; IN
K d;"G": READ t,u: BEEP t,u: DAT
A q,E,q,o,q,D,q,-VAL "5",q,E,q,o
,q,D,q,-VAL "5",q,E,q,o,q,D,q,-V
AL "5",dc,o
 170 PAUSE VAL "25": INK VAL "7"
: BORDER VAL "6": PAPER VAL "3":
 CLS : PAUSE VAL "20": LET j=m:
LET i=j: LET f$="DEDEDEDEDEDEC  ":
 LET m$=f$+" HOW GOOD ARE YOU AT
 CAROLS?   ": GO SUB d: PAUSE VA
L "50": LET i=o: LET j=VAL "5":
LET m$=f$+" WHEN YOU RECOGNISE T
HE TUNE    ": GO SUB d: LET j=VAL
 "7": LET m$=f$+"PRESS THE NUMBE
R OF YOUR CHOICE": GO SUB d: PAU
SE VAL "30": LET j=VAL "10": LET
 m$=f$+"       THE FASTER YOU ARE
       ": GO SUB d: LET j=VAL "1
1": LET m$=f$+"      THE BETTER Y
OUR SCORE      ": GO SUB d: PAUSE
 VAL "30": LET j=VAL "13": LET m
$=f$+"    BUT DON'T MAKE A MISTAK
E!    ": GO SUB d: PAUSE VAL "150
": PRINT AT VAL "18",VAL "6";"Pr
ess ENTER to start": PAUSE o
 175 PAPER VAL "7": CLS : INK o:
 RESTORE VAL "175": FOR n=m TO
VAL "8": READ t$: PRINT AT o,VAL
 t$;x$: NEXT n: RESTORE VAL "175
": FOR n=m TO VAL "8": READ t$:
PRINT AT VAL "21",VAL t$;y$: NEX
T n: DATA "0","4","8","12","17",
"21","25","29"
 180 PRINT AT o,o': FOR n=VAL "1
000" TO VAL "5500" STEP VAL "500
": RESTORE n: READ a$: PRINT n/V
AL "500"-d;". ";a$: NEXT n: PRIN
T '"   Which Carol? (Press numbe
r)"
 200 LET s=o: LET p=s: LET yy=VA
L "112": LET ys=INT PI: LET xs=d
: FOR i=m TO VAL "150": NEXT i
 210 FOR v=m TO VAL "10": LET w=
INT (RND*VAL "10"): IF w=o THEN
 LET w=VAL "10"
 215 RESTORE w*VAL "500"+VAL "50
0": READ a$: LET r=INT (RND*VAL
"10"+VAL "5"): FOR n=m TO r: REA
D t,u: NEXT n: FOR n=r TO r+VAL
"30": READ t,u: BEEP t,u: IF INK
EY$<>"" THEN  GO TO VAL "310"
 220 NEXT n: LET p$="Too slow":
GO SUB VAL "5": BEEP 1,-24: GO T
O VAL "330"
 310 IF INKEY$<>STR$ (w-m) THEN
 FLASH m: LET p$="WRONG": GO SUB
 VAL "5": BEEP 1,-12: LET s=s+VA
L "15": FLASH o: GO TO VAL "330"
 320 FLASH m: LET p$="CORRECT!":
 GO SUB VAL "5": FOR i=m TO VAL
"5": BEEP .1,36: NEXT i: FLASH o
 330 LET s=s+n-r: PRINT AT VAL "
19",VAL "11";"SCORE =";s: FOR n=
m TO VAL "200": NEXT n: FOR n=VA
L "12" TO VAL "20": PRINT AT n,o
;z$: NEXT n: NEXT v
 349 LET a$="PPKPPKPPKPPKPP": LE
T b$="JI": LET c$="HJ"
 350 BORDER INT PI: PAPER VAL "6
": CLS : INK m: LET p$="SCORE":
LET yy=VAL "64": GO SUB VAL "5":
 LET p$=STR$ s: LET yy=VAL "88":
 GO SUB VAL "5"
 360 LET s=VAL "7": PRINT AT VAL
 "6",s;"QS";a$;"QS";AT s,s;"TU";
AT s,VAL "23";"TU";AT s+s,s;"QS"
;AT s+s,VAL "23";"QS";AT VAL "15
",s;"TU";a$;"TU": FOR n=VAL "9"
TO VAL "12" STEP d: PRINT AT n,s
;b$;AT n+m,s;c$;AT n,VAL "23";c$
;AT n+m,VAL "23";b$: NEXT n
 900 PAUSE VAL "25": LET z=m: RE
STORE VAL "900": LET x=VAL ".35"
: LET y=VAL ".1": FOR j=m TO VAL
 "30": READ t,u: BEEP t,u: GO SU
B 3: NEXT j: PAUSE VAL "50": PRI
NT #0;"Press ENTER to play again
": PAUSE o: GO TO VAL "175": DAT
A x,D,x,G,y,G,y,A,y,G,y,FS,x,E,x
,0,x,E,x,A,y,A,y,B,y,A,y,G,x,FS,
x,D,x,FS,x,B,y,B,y,TC,y,B,y,A,x,
G,x,E,y,D,y,D,x,E,x,A,x,FS,.5,G
 920 STOP
1000 DATA "Hark! The Herald Ange
ls Sing",c,D,c,G,dc,G,q,FS,c,G,c
,B,c,B,c,A,c,TD,c,TD,dc,TD,q,TC,
c,B,c,A,m,B,c,D,c,G,dc,G,q,FS,c,
G,c,B,c,B,c,A,c,TD,c,A,dc,A,q,FS
```

```
,c,FS,c,E,m,D,c,D,c,G,dc,G,q,FS,
c,G,c,B,c,B,c,A,c,TD,c,TD,dc,TD,
q,TC,c,B,c,A,m,B,c,D,c,G,dc,G,q,
FS,c,G,c,B,c,B,c,A,c,TD,c,A,dc,A
,q,FS,c,FS,c,E,m,D
1500 DATA "It Came Upon a Midnig
ht Clear",q,F,q,G,c,A,c,G,c,F,q,
G,q,A,c,BF,c,A,c,G,c,TC,c,TC,c,A
,q,BF,q,TC,c,TD,dm,TC,q,A,q,BF,c
,TC,c,TC,c,A,c,F,c,BF,c,A,c,G,q,
F,q,G,q,A,q,BF,c,TC,c,A,c,G,dm,F
,q,F,q,G,c,A,c,G,c,F,q,G,q,A,c,B
F,c,A,c,G,c,TC,c,TC,c,A,q,BF,q,T
C,c,TD,dm,TC,q,A,q,BF,c,TC,c,TC,
c,A,c,F,c,BF,c,A,c,G,q,F,q,G,q,A
,q,BF,c,TC,c,A,c,G,dm,F
2000 DATA "O Come, All Ye Faithf
ul",c,G,m,G,c,D,c,G,m,A,m,D,c,B,
c,A,c,B,c,TC,m,B,c,A,c,G,m,G,c,F
S,c,E,c,FS,c,G,c,A,c,B,m,FS,dc,E
,q,D,d,D,c,G,m,G,c,D,c,G,m,A,m,D
,c,B,c,A,c,B,c,TC,m,B,c,A,c,G,m,
G,c,FS,c,E,c,FS,c,G,c,A,c,B,m,FS
,dc,E,q,D,d,D
2500 DATA "Once in Royal David's
 City",c,D,c,FS,dc,G,q,G,q,G,q,F
S,q,G,q,A,c,A,c,G,c,G,c,B,dc,TD,
q,B,q,B,q,A,q,G,q,FS,m,G,c,TE,c,
TE,dc,TD,q,G,c,TC,c,TC,m,B,c,TE,
c,TE,dc,TD,q,B,q,B,q,A,q,G,q,FS,
m,G,c,D,c,FS,dc,G,q,G,q,G,q,FS,q
,G,q,A,c,A,c,G,c,G,c,B,dc,TD,q,B
,q,B,q,A,q,G,q,FS,m,G,c,TE,c,TE,
dc,TD,q,G,c,TC,c,TC,m,B,c,TE,c,T
E,dc,TD,q,B,q,B,q,A,q,G,q,FS,m,G
3000 DATA "See Amid the Winter's
 Snow",dc,G,q,A,c,G,c,FS,dc,E,q,
D,m,D,c,G,c,A,c,TC,c,B,dc,B,q,A,
m,A,dc,TD,q,TD,c,TC,c,B,c,A,c,G,
m,FS,dc,TD,q,TD,c,TC,c,B,c,A,c,G
,m,FS,dc,G,q,A,c,G,c,FS,dc,E,q,D
,m,D,dc,TD,q,B,c,G,c,TC,c,B,c,A,
m,G,dc,G,q,A,c,G,c,FS,dc,E,q,D,m
,D,c,G,c,A,c,TC,c,B,dc,B,q,A,m,A
,dc,TD,q,TD,c,TC,c,B,c,A,c,G,m,F
S,dc,TD,q,TD,c,TC,c,B,c,A,c,G,m,
FS,dc,G,q,A,c,G,c,FS,dc,E,q,D,m,
D,dc,TD,q,B,c,G,c,TC,c,B,c,A,m,G
3500 DATA "The First Nowell",q,E
,q,D,dc,o,q,D,q,E,q,F,m,G,q,A,q,
B,c,TC,c,B,c,A,m,G,q,A,q,B,c,TC,
c,B,c,A,c,G,c,A,c,B,c,TC,c,G,c,F
,m,E,q,E,q,D,dc,o,q,D,q,E,q,F,m,
G,q,TC,q,B,m,A,c,A,dm,G,c,TC,c,B
,c,A,c,G,c,A,c,B,c,TC,c,G,c,F,m,
E,q,E,q,D,dc,o,q,D,q,E,q,F,m,G,q
,A,q,B,c,TC,c,B,c,A,m,G,q,A,q,B,
c,TC,c,B,c,A,c,G,c,A,c,B,c,TC,c,
G,c,F,m,E,q,E,q,D,dc,o,q,D,q,E,q
,F,m,G,q,TC,q,B,m,A,c,A,dm,G,c,T
C,c,B,c,A,c,G,c,A,c,B,c,TC,c,G,c
,F,m,E
4000 DATA "Silent Night",dc,G,q,
A,c,G,dm,E,dc,G,q,A,c,G,dm,E,m,T
D,c,TD,dm,B,m,TC,c,TC,dm,G,m,A,c
,A,dc,TC,q,B,c,A,dc,G,q,A,c,G,dm
,E,m,A,c,A,dc,TC,q,B,c,A,dc,G,q,
A,c,G,dm,E,m,TD,c,TD,dc,17,q,TD,
c,B,dm,TC,dm,TE,dc,TC,q,G,c,E,dc
,G,q,F,c,D,dm,o,dc,G,q,A,c,G,dm,
E,dc,G,q,A,c,G,dm,E,m,TD,c,TD,dm
,B,m,TC,c,TC,dm,G,m,A,c,A,dc,TC,
q,B,c,A,dc,G,q,A,c,G,dm,E,m,A,c,
A,dc,TC,q,B,c,A,dc,G,q,A,c,G,dm,
E,m,TD,c,TD,dc,17,q,TD,c,B,dm,TC
,dm,TE,dc,TC,q,G,c,E,dc,G,q,F,c,
D,dm,o
4500 DATA "Away in a Manger",c,0
,c,F,c,F,q,G,q,A,c,F,c,F,q,A,q,B
F,c,TC,c,TC,c,TD,m,BF,q,G,q,A,c,
BF,c,BF,c,TC,c,A,c,A,q,F,q,A,c,G
,c,D,c,F,m,E,c,o,c,F,c,F,q,G,q,A
,c,F,c,F,q,A,q,BF,c,TC,c,TC,c,TD
,m,BF,q,G,q,A,c,BF,c,BF,c,TC,c,A
,c,A,q,F,q,A,c,G,c,D,c,E,m,F,c,o
,c,F,c,F,q,G,q,A,c,F,c,F,q,A,q,B
F,c,TC,c,TC,c,TD,m,BF,q,G,q,A,c,
BF,c,BF,c,TC,c,A,c,A,q,F,q,A,c,G
,c,D,c,F,m,E,c,o,c,F,c,F,q,G,q,A
,c,F,c,F,q,A,q,BF,c,TC,c,TC,c,TD
,m,BF,q,G,q,A,c,BF,c,BF,c,TC,c,A
,c,A,q,F,q,A,c,G,c,D,c,E,m,F
5000 DATA "Good King Wenceslas",
c,G,c,G,c,G,c,A,c,G,c,G,m,D,c,E,
c,D,c,E,c,FS,m,G,m,G,c,G,c,G,c,G
,c,A,c,G,c,G,m,D,c,E,c,D,c,E,c,F
S,m,G,m,G,c,TD,c,TC,c,B,c,A,c,B,
c,A,m,G,c,E,c,D,c,E,c,FS,m,G,m,G
,c,D,c,D,c,E,c,FS,c,G,c,G,m,A,c,
TD,c,TC,c,B,c,A,m,G,m,TC,2,G,c,G
,c,G,c,G,c,A,c,G,c,G,m,D,c,E,c,D
,c,E,c,FS,m,G,m,G,c,G,c,G,c,G,c,
A,c,G,c,G,m,D,c,E,c,D,c,E,c,FS,m
,G,m,G,c,TD,c,TC,c,B,c,A,c,B,c,A
,m,G,c,E,c,D,c,E,c,FS,m,G,m,G,c,
D,c,D,c,E,c,FS,c,G,c,G,m,A,c,TD,
c,TC,c,B,c,A,m,G,m,TC,d,G
5500 DATA "While Shepherds Watch
ed",c,F,dc,A,q,A,c,G,c,F,c,BF,c,
BF,c,A,c,G,c,A,c,TC,c,TC,c,B,dm,
TC,c,A,dc,TD,q,TC,c,BF,c,A,c,G,c
,F,c,E,c,A,c,G,c,F,c,F,c,E,dm,F,
c,F,dc,A,q,A,c,G,c,F,c,BF,c,BF,c
,A,c,G,c,A,c,TC,c,TC,c,B,dm,TC,c
,A,dc,TD,q,TC,c,BF,c,A,c,G,c,F,c
,E,c,A,c,G,c,F,c,F,c,E,dm,F
9998 CLEAR VAL "32255": LOAD ""C
ODE : LOAD ""CODE : RUN
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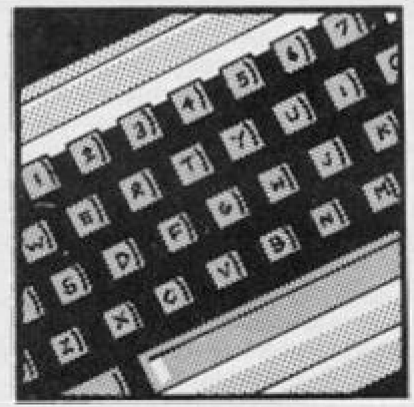
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First steps in Machine Code

Part 1. Basic Concepts



An introduction to Z80 Machine Code by David Nowotnik

After BASIC, the most popular method of programming home computers would appear to be machine code. This 'language' offers the advantage of being in-built in the computer (as it is fundamental to its operation), and readily accessible from BASIC through the USR function. The attraction of machine code is that programs run much faster (often 100 times faster than BASIC), but there is a price to be paid for that speed. Programming in machine code is considerably more difficult than BASIC.

For the past few years *ZX Computing* has brought you many articles containing sophisticated machine code routines. While these have been well received by those with some knowledge of machine code, we have received many letters from other readers who would like to understand machine code, but find many of our articles too complicated. It is for those readers I am starting a six part series introducing machine code on the ZX81 and Spectrum.

The series is intended for complete beginners, but if you already know a little machine code, then I hope you'll still find a lot to interest you in this series. In each part, I shall provide some theory on machine code, and some examples to practice on the ZX81 and on the Spectrum. To begin to understand machine code, we have to know something about how computers work. And that's where I'll start.

What is machine code?

Most modern-day computers, and certainly all home computers, process information stored in two states; we can think of these states, or BITS, as 0 or 1 — off or an — similar to a switch. Most home computers store information in blocks of eight bits. A BYTE is the name given to a block of 8 bits. Since each bit can have one of two possible states, then there are a total of 256 (2∧8) combinations of bits within a byte. If you don't want to take my word for it, see how many different combinations of 1's and 0's you can produce by combining 8 at a time!

Instead of thinking of a byte as a block of 8 bits, we can think of it as a number, an integer between 0 and 255. Each number represents a certain combination of bits. For more advanced machine code, we'll have to go back to examining the bits that make up a byte, but for now we can use machine code by just using numbers.

In this way, numbers (0-255) are stored in the computer's memory. ROM (Read Only Memory) forms a fixed store of numbers, while RAM (Random Access Memory) allows the stored numbers to be modified by user. Each byte in the computer's memory is identified by an ADDRESS. The address is itself a number, and it will normally be between 0 and 65535 (the exact range depending on the amount of memory built into the computer and certain other features of the microprocessor).

Simply then, the computer works by moving and manipulating numbers, under program control. The control is provided by a special 'chip' called the central processing unit (CPU). The ZX81 and Spectrum have the same CPU — the Zilog Z80. A block diagram of the Z80 is shown in figure 1. It is this chip that manipulates machine code instructions to operate the computer. So, to understand machine code, we need now to take a closer look at how the Z80 works.

There are a number of internal 8 bit stores in the CPU. These are similar to bytes in memory, and are called REGISTERS. They store (and manipulate) numbers in the CPU. They are given names A,F, B,C,D,E,H, and L. There are also some special purpose 16 bit registers called IX,IY,SP, and PC. Throughout the series I'll deal with most of these.

The CPU is connected to the rest of the computer through a number of connections called "buses". Simply, these comprise 8, or 16, 'wires' to transport electrical signals to and from other parts of the computer. To receive an instruction, the first thing the CPU does is to put onto the address bus the contents of the PC 16-bit register. PC is short for Program Counter, and it contains the address in memory where the next machine code instruction is held. That itself raises a lot of questions, which I hope to answer later. Circuitry outside the CPU decodes the message on the address bus to 'activate' or access the required address in memory. The contents of that address are placed on the DATA BUS, and this number is then transported to the CPU.

This number is a coded instruction to the CPU (called an OPCODE) which is decoded by the CPU, which then follows a fixed sequence of operations appropriate to that instruction. When complete the PC register is incremented (in BASIC this would be LET PC = PC + 1), and the next instruction is fetched

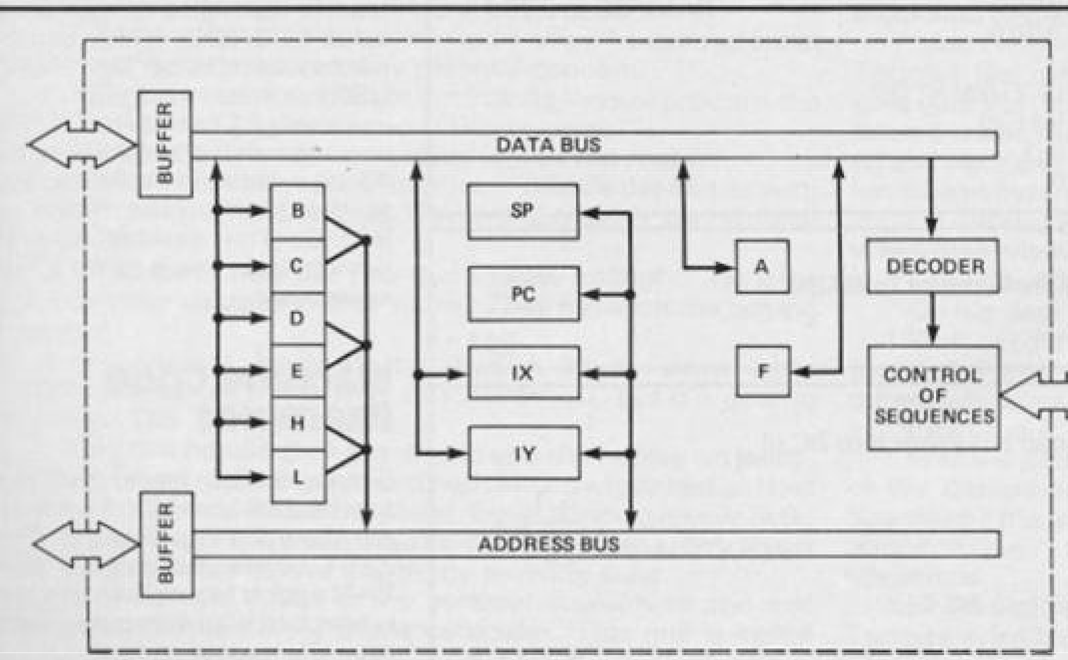


Figure 1. Internal Architecture of the Z80 CPU

from memory.

The Z80 CPU understands over 800 different instructions. Clearly, as one byte from memory can only hold 256 different numbers, sometimes more than one byte is required to complete the upcode; there are a large number of two byte opcodes. The CPU understands that, when the first byte is decoded, it requires a second byte to complete the instruction. To fetch this number, the PC register is incremented, and the same sequence of events, as described earlier, takes place.

Many instructions to the CPU require some data to be provided. These appear as numbers which follow immediately after the opcode in memory. These are fetched from memory in much the same way as opcodes, but are transported to a different part of the CPU, depending upon the requirements of the opcode. These data bytes are called OPERANDS. There can be one or two operands per opcode. Therefore, a single instruction to the CPU can be anything from one to four bytes long.

Other 'wires' from the CPU send out, and receive, control signals which ensure that all these operations occur at the right time. The CPU is under the control of a clock which acts in much the same way as a metronome, beating out a time sequence with which the CPU must keep step. The faster the clock, the faster the CPU will work, within the physical limits of the CPU, of course.

Assembly Language

A common mistake in terminology is to mix up the names machine code and assembly language. I hope it is clear from my description what constitutes machine code; it is the sequence of numbers held in the computer's memory which give the CPU instructions on what to do. While the CPU understands numbers, these are not readily understood by humans, who would prefer something closer to the written language. For example, when the CPU receives the number 62 (as an opcode), it interprets this (in human terms) as "load the A register with the number in the next memory location". That description is somewhat cumbersome, but we could adopt a shorthand which means the same thing. Assembly language gives us that shorthand — LD A,n (LoaD into A the number). Assembly language, therefore, is a descriptive shorthand of machine code operations. It is easier to write machine code in assembly language, then have a special program, called an assembler, translate assembly language into machine code. The reverse translation is called disassembly.

This series will cover both machine code and assembly language, all examples will be provided in both forms.

How to store and use machine code

Machine code is a series of numbers stored in the computer's memory; these numbers need to be kept in a safe place where they can remain undisturbed by the invisible workings of BASIC. One of the safest storage areas in both the ZX81 and the Spectrum is above RAMTOP (the address in RAM which is the highest accessible to BASIC). Lowering RAMTOP creates a safe area of RAM into which machine code can be loaded.

Once RAMTOP is lowered (we'll deal with that in a moment), then machine code can be entered. For now, the best way to do this is use a BASIC loader; a program which POKEs values into a series of bytes above RAMTOP, these values being the numbers which make up machine code. The examples in this article all use the BASIC loader principle.

Once the machine code is in place, you then have to get it to operate. The BASIC word for this is USR. USR is a function; that is, to complete its syntax, it has to have what's called an ARGUMENT. The argument is the starting address of the machine code routine, then valid BASIC instructions to operate that machine code routine are:

PRINT USR 3200
RAND USR 32000 (on the ZX81)
RANDOMIZE USR 32000 (on the Spectrum)
LET T= USR 32000
IF USR 32000 THEN. . . .

There are others, but these are the ones most commonly used.

The way USR works is to store the current contents of the PC register, then puts into PC the argument of USR. The reason the original address is PC is stored is that, once the machine code is complete, a return to BASIC is possible provided that the machine code is written to allow that return. A machine code routine can be much like a subroutine in BASIC, with the BASIC program continuing from the place it left off once control is handed back to BASIC.

Figure 2. ZX81 machine code loader

```
10 POKE 16388,47           Lowers RAMTOP to
20 POKE 16389,117          address 29999
30 LET X=30000*
40 INPUT A$
50 IF A$ ="S" THEN STOP
60 POKE X, VAL A$
70 LET X=X+1
80 GOTO 40
```

Figure 3. Spectrum machine code loader

```
10 CLEAR 29999             RAMTOP to 29999
30 LET x=30000
40 INPUT a$
50 IF a$ ="s" THEN STOP
60 POKE x, VAL a$
70 LET x=x+1
80 GO TO 40
```

Figure 4(a)

Example 1. Simple return to BASIC

```
RET                        201
```

Figure 4(b)

Example 2. Load a number into BC (i)

```
LD B,1                     6,1
LD C,50                    14,50
RET                        201
```

Load a number into BC (ii)

```
LD BC,500                  1,244,1
RET                        201
```

Like RETURN in BASIC which ends a BASIC subroutine, there is a machine code instruction which ends a machine code subroutine. In assembly language this mnemonic is RET; the machine code value is 201. You'll see this in most of my examples, for without it (or something similar) the computer cannot hand back control to BASIC. The result of this would be that the computer continues without you being able to stop it, or it gets totally confused — and crashes! The only solution to either of these is to pull out the power lead, which wipes everything from RAM, and start again. This is one of the main frustrations of machine code, for if you make the slightest error, a'crash' is likely, which means you lose everything you placed into the computer. The golden rule of machine code is to save on tape any machine code **BEFORE** you run that machine code — just in case.

16-bit registers

Earlier, I mentioned that there are several stores of data in the CPU called registers. Each register holds an 8 bit number, giving a range of 0 to 255. The Z80 has the facility for combining certain registers, such that the combined register can hold a 16-bit number. This provides an effective range of 0 to 65535. The combined registers are H with L, D and E, and B with C.H,D, and B are the 'high' bytes, while L,E, and C are 'low' bytes. The 16-bit number is calculated as 256 times the value in the high register plus the value in the low register.

You may have noticed from the USR instructions given earlier that a machine code routine can give a numerical value to BASIC, which can be printed on the screen (PRINT USR. . .) or assigned to a variable (LET T = USR. . .). The number handed to BASIC is the 16-bit number in the BC register at the time of the return to BASIC. The easiest way to demonstrate this is to try a few examples.

Machine Code Examples

Simple BASIC loader routines for the ZX81 and ZX Spectrum are shown in Figs 2 and 3. The ZX81 version assumes a 16K RAM pack is fitted. First type the loader into your computer, then save the routine on tape.

All the examples given in this article will work on both

machines; these are shown in Fig.4. To try the examples, RUN the loader program, and enter the numbers on the right hand side of Fig.4., ending with an 's' to terminate the loading routine. For instance, in example 1, you just enter 201 followed by 's', and in example 2(1) enter 6,1,14,50,201 (pressing NEWLINE/ENTER after each number) and end with 's'.

All you have in example 1 is a simple return to BASIC. So, after you have loaded the single byte, and activated it with RANDOMIZE USR 30000 nothing happens. However, you may like to consider it an achievement to enter a machine code routine, and return safely from it! Its just like a BASIC subroutine in which the first line is RETURN. If you use PRINT USR 30000, then a number is printed on the screen. It should be 30000; the USR routine puts this number into BC as well as into PC, so this is the number which is in BC on return to BASIC, and so is printed on the screen. The remaining examples in Fig.4. all modify the contents of BC before the return to BASIC so use PRINT USR 30000 with all of these to see the effect.

In example 2(1) the B and C registers are loaded with 2 numbers 1 and 50 respectively. Notice that the opcode (LD B) is followed by the operand (1) the number loaded in B; similarly the operand 50 follows the opcode (14) to load a number into C. The BC register pair now contains (1x256)+50=306; this is the number you should see printed on the screen.

A different way of loading a number into BC is shown in 2(11). A single opcode (1) instructs the CPU to load the next two numbers into BC. Note the first number (244) is loaded into C, and the second into B. This is a machine code convention — in a 2 byte number, the low byte is dealt with first, then the high byte. LD BC, number is a 3 byte instruction, the first byte is the opcode, followed by 2 operand bytes. There are similar instructions to load the HL and DE registers, one at a time, or as a pair.

In example 3, the contents of the HL register are loaded into BC before turn. It is possible to load the contents of any one register into another, but there are no instructions which move one register pair to another. The result you see printed on PRINT USR 30000 may well vary, as this depends on the contents of HL at the time of calling the routine. The final example mimics the BASIC instruction PRINT PEEK 30000. The B register is loaded with 0, and the A register is loaded with the contents of byte address 30000. The brackets around 30000 in the assembly language instruction LD A,(30000) means 'the contents of'. As there is no instruction LD C,(30000), we have to load this byte value into A first, then transfer it to C with LD C,A. Address 30000 contains the first byte of our machine code routine, so you should see 6 printed on the screen.

So far, the machine code examples have not been earth-shattering, but, as it is said, from acorns (small a!) mighty oaks do grow. So, if you've got this far, and followed most of what I have said, then in the next issue of *ZX Computing*, I'll be introducing more of the instruction set, and have a few more examples, some which might just produce a "wow".

Figure 4(c)

Example 3. Load the contents of HL into BC

```
LD B,H          68
LD C,L          77
RET             201
```

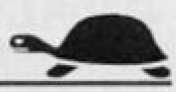
Figure 4(d)

Example 4. PEEK an address in memory

```
LD B,O          6,0
LD A,(30000)    58,48,117
LD C,A          79
RET             201
```

Tortoise wise

or lines from a parent who gets left behind by David Stewart



My twelve year old son is looking miserable.

"What's the problem son? Can I help?" I use my most sympathetic tone to convey parental concern.

"Only if you know how to get infinite lives or produce the kind of screen graphics in an Ultimate game."

He stands up and head bowed leaves the room.

I turn to his nine year old brother. "What's the matter with him?" I ask. "Infinite Life? Ultimate Game? It's a bit deep isn't it?"

"You can't help us. You don't know enough." He joins his brother upstairs in their room. They have left me behind again.

We parents have always had a lot to cope with. Masochists call it the Joys of Parenthood. But it's getting worse. The "Joys" I mean.

Oh I can handle their pop music and their spray on jeans. When I dyed my hair green and had my nosed pierced all I lost were my friends and a little blood. Break dancing is only likely to cripple me or advance my arthritis. Nothing to worry about as long as I stay in touch with my growing sons.

No, the real threat to my cerebral equilibrium and self respect comes from a home computer. This one is called Spectrum. Before that we had another called ZX81. And I've tried, Heaven knows I've tried, and I'm still trying to get on with these visitors from the future.

But no matter how hard I try to "get it all together" computer-wise, in no time at all it's all hanging out and falling apart.

Remember the tale of the Tortoise and the Hare? Well I'm the Tortoise and I've got at least TWO hares to contend with. Tortoise-wise, I'm losing the race not to mention what little dignity I've got left as a middle aged parent.

Wasn't there a time not so long ago when parents were supposed to know everything and be able to do most things?

I'll bet I'm not alone either. Tortoise-wise. I'll bet there's a Tortoise like me in practically every other home in Britain who gets the Jet Set Willies and the Yoodeegees a hundred times a week. Not to mention having our numbers Randomised and our Variables Poked. And I'm not sure but I think I may have been bytten once or twice.

"He doesn't even know what BASIC means", they scoff when their friends come round.

"I do I do. It's a computer language."

"Oh big deal, what does it stand for?"

"Wait....I did know, I read it in a book. I've just forgotten that's all. I've got other things to think about apart from computers you know".

"Like what?" they ask innocently.

"Well we don't know that one. It's probably for the BBC or the Commodore 64. Dad, when can we have another Spectrum? It's boring with only one. Then you could buy us micro drives for our birthday and a Modem for Christmas....."

Is there such a thing as a microdriving licence I wonder. Tortoise-wise it's going to be a long race I fear.

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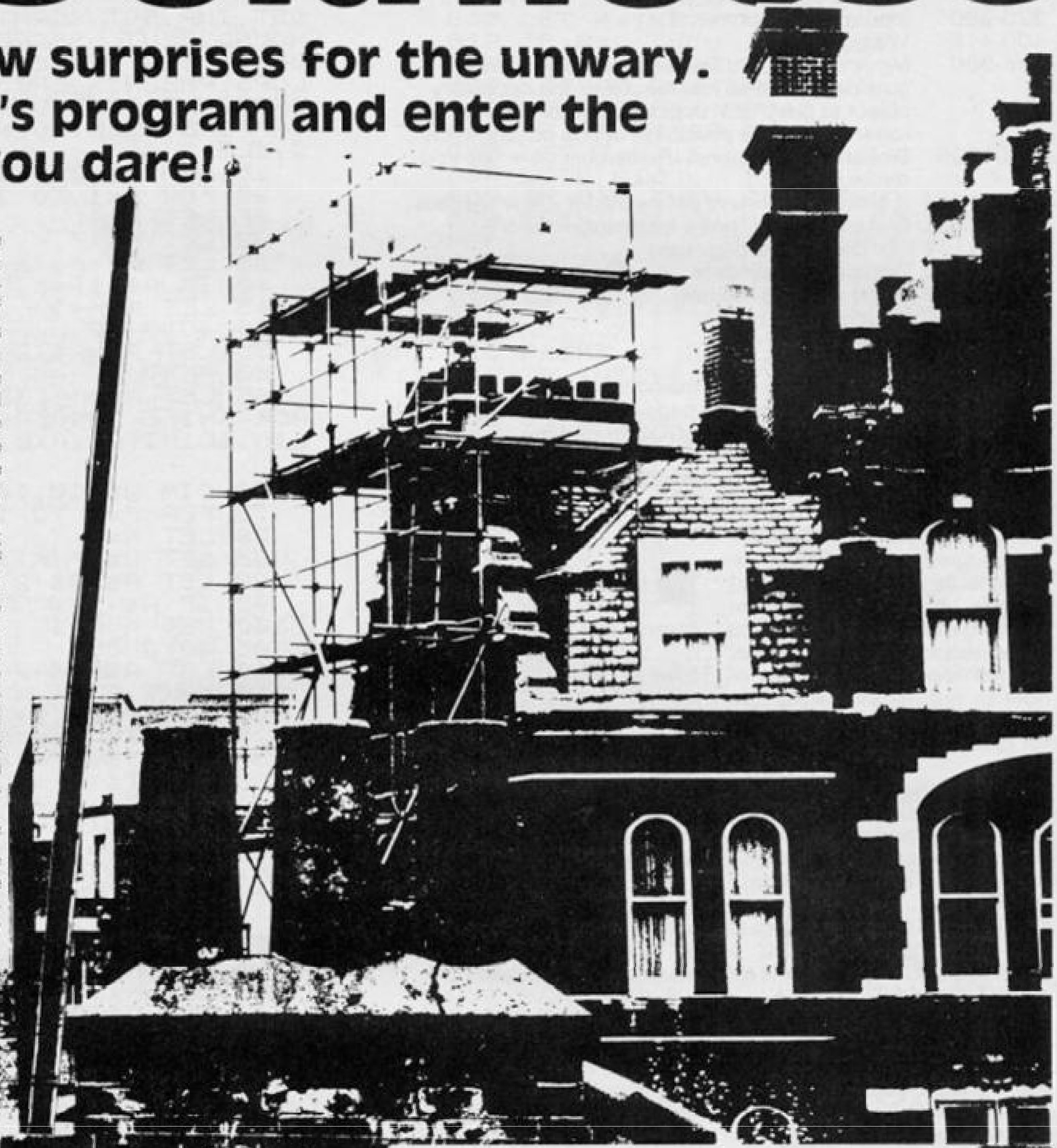
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This old house

still has a few surprises for the unwary. Enter N Kidd's program and enter the house – if you dare!



There are a lot of adventure games currently available on mail order (most are rather expensive) but a distinct lack of such games in magazines. This is just one of the reasons why I have written this game for the 16K ZX81. There are several others! Firstly, I think people should enjoy playing the game and at the same time learn more about programming technique; secondly, I need the money!

The idea of the game is that the player finds himself transported to an old house and must escape, but find the password and £100 before he reaches the exit. Just to make it difficult, he will encounter various problems on his way such as darkened rooms, locked doors and no floor but I will not reveal any more – it's up to you to find out with the aid of the instructions.

With a little knowledge of computing, a key to the variables I have used and a guide as to what each part of the program does, the game is easily adaptable and a lot of fun. Honest!

Variable Use

M$(,)	Monster string – holds the 30 monsters' names
W$(,)	Weapons string – holds the 10 weapons you could find and use
T$(,)	Treasure string – holds the different types of hidden treasure
O$(,)	Object string – holds the 9 objects to aid you on your journey
P$(,)	Password string – holds the 9 different passwords that could be chosen
Q$	Today's password
R$	Your present weapon
A$(1)	Your 'guess' at todays password
A$	'Does all the work' string
E$,K$,L$	Memory saving strings (saves printing out statements many times)
I$(4)	Objects you can use
T	The amount of treasure you can have (in £)
I	Injuries incurred during battle
E	Energy at present
W	Weapon code (R$ = W$(W))
S	Fight strength (depends on W, I and E)
AA,BB	Your location on the screen from the 'AT' command
AAA,BBB	Direction in which to move (representing cursor numbers)
L	CHR$L = abbreviated character for either dark room, no floor or exit
MS	Strength of monster
A	What will happen to you this turn? (in line 1440)
S$(64)	Will clear two lines of print but not destroy the rest of the display as CLS does (note S$(to 32) will only clear one line)
KK,Z,WWE, F,K,G,X,A, B,OO	Less important, hardworking variables sometimes doing more than one job

Structure of the program

Lines	Function
10-60	Defines monsters' names using ZX81 READ/DATA routine
65-120	Defines weapons
120-145	Defines types of treasure

150-200	Defines objects that you may find
205-240	Defines password
260-355	Sets up screen display of house. Note the part that prints an * then later PEEKs the screen for these asterisks and changes them to an open/closed door or a thin wall
370-380	Inputs user's command
400-418	Wait routine
425-900	Move routine. Is it open/closed door or thin/outside wall? If so has the player the necessary object to pass? If Y then look out for a darkened room etc., or the possibility of one coming soon
915-1005	Broken object routine. (Remember L$ = "So you throw it away")
1010-1014	If lucky print todays password for a few seconds
1030-1036	Broken weapon, find a less dangerous one
1110-1114	Oh! back to the beginning
1200-1235	Prepare monster data
1240-1426	Battle with the monster
1410-1670	Finding an object
1710-1770	Finding a weapon
1780-1981	Using an object
2000-2080	Reaching the exit – the tests
9000-9095	Print the instructions page by page
9100-9130	Your new status (as a GOSUB routine)
9900-9930	Setting up variables
9990-9994	Saving program during running

Now you should be able to adapt the program to your own requirements or add a few more objects, but watch out for memory overflow! To give you some idea of how this is done, the following is an example of how to put another word into the repetition of the password for today.

1) For another four letter word (a respectable one!)
Edit line 205 and place the new word directly after SNAP
Edit line 210 and change it to P$(10,4)
Edit line 215 and change it to F = 1 to 10
Edit line 9990 and change it to A = INT(RND * 10)

2) For a six letter word eg PIRATE
Edit line 205, adding two spaces after every word and place the new word after SNAP.. Pirate. Now carry on as for 1) but substitute the 4 in line 210 for a 6.

Simple but effective isn't it? Once you have got the hang of it you could almost completely change the program.

For those with a Spectrum, line 320 can be changed to (I quote from the ZX81 manual) "Address of print position in display file can be POKEd so that print output is sent elsewhere." Thus, line 320 now reads 'Print at F,G;' (don't forget the ;) and CHR$ 23 = "*". The other CHR$ values are:

⊠ = c

I = 46

. = 27

■ = 128

Inverse D = 169

Inverse E = 170

Inverse F = 171

Note. There are only a few graphic characters to be careful with in this program, in general the following abbreviations have been used.

1. Lower case letters on their own are inverse letters.
2. Graphic characters are indicated by lower case "9".

When a number of graphics are needed you will see notation as in line 301 (eg g3 + 9g6 + g4). This means a graphic found on key 3, nine of the graphics on key 6 and a graphic from key 4. Note "is" means "Inverse space" or graphics space.

The following lines contain these notations: 260, 270, 280, 292, 300 (e only), 301, 302, 370, 9060, 9070.

Despite the occasional spelling mistake, this is an excellent game and worth the time spent in entering it. The only problem Spectrum users may find is with the PEEK (PEEK 16398 + 256 * PEEK 16397). This returns the character code of whatever is at the screen position specified by the previous line (see lines 315/320). Replace with the SCREEN£(f,g) and the appropriate character number to allow for the difference in ZX81 and Spectrum character codes.

```
   2 CLEAR
   3 SLOW
   4 LET A$="THIS OLD HOUSE"
   5 SAVE A$
   7 FAST
  10 LET A$="GIANT GNAT,TROLL,GH
OST,IMP,BAT,GIANT,ZOMBIE,WIZARD,
HOUND,DEVIL,SERPENT,RAT,DRAGON,G
OBLIN,BIG SPIDER,HYDRA,DEMON,CYC
LOPS,PHEONIX,SPECTRE,SALAMANDER,
GARGOYLE,BEHEADER,JUBILEX,WITCH,
VAMPIRE,HELL HOUND,HUGE GUARD,OR
C,ELF,"
  15 DIM M$(30,10)
  20 FOR F=1 TO 30
  25 LET K=1
  30 LET M$(F,K)=A$(1)
  35 LET A$=A$(2 TO )
  40 IF A$(1)="," THEN GOTO 55
  45 LET K=K+1
  50 GOTO 30
  55 LET A$=A$(2 TO )
  60 NEXT F
  65 LET A$="SCISSOR,PEN KNIFE,J
ACK-KNIFE,DAGGER,FOIL,LANCE,JAVE
LIN,SCIMITAR,AXE,SWORD,"

  70 DIM W$(10,10)
  75 FOR F=1 TO 10
  80 LET K=1
  85 LET W$(F,K)=A$(1)
  90 LET A$=A$(2 TO )
  95 IF A$(1)="," THEN GOTO 110
 100 LET K=K+1
 105 GOTO 85
 110 LET A$=A$(2 TO )
 115 NEXT F
 120 DIM T$(5,9)
 125 LET T$(1)="BRONZE"
 130 LET T$(2)="SILVER"
 135 LET T$(3)="GOLD"
 140 LET T$(4)="PLATIGNUM"
 145 LET T$(5)="DIAMOND"
 150 LET A$="HAMMER,TORCH,KEY,PL
ANK,FOOD,DRINK,BANDAGE,SPLINT,PA
SS WORD,"

 155 DIM O$(9,9)
 160 FOR F=1 TO 9
 165 LET K=1
 170 LET O$(F,K)=A$(1)
 175 LET A$=A$(2 TO )
 180 IF A$(1)="," THEN GOTO 195
 185 LET K=K+1
 190 GOTO 170
 195 LET A$=A$(2 TO )
 200 NEXT F
 205 LET A$="FISHCHIPEGGSCLAMFOU
RNICECHATCLAPSNAP"
 210 DIM P$(9,4)
 215 FOR F=1 TO 9
 220 LET P$(F)=A$(1 TO 4)
 230 LET A$=A$(5 TO )
 240 NEXT F
 245 GOSUB 9900
 250 GOTO 9000
 260 PRINT "■■■■■■■■■■■■■■■■■■■■■■■
■■■■■■■■■"
 265 FOR F=1 TO 7
 270 PRINT "■ * * * * * * * * * *
* * * * * ■"
 280 PRINT "■*■*■*■*■*■*■*■*■*■*■*
■*■*■*■*■*■"
 290 NEXT F
 292 PRINT "■ * * * * * * * * * *
* * * * * ■"
 295 PRINT AT 16,0;"■■■■■■■■■■■■■■
■■■■■■■■■■■■■■■■■■"
 300 PRINT AT 2,1;".";AT 1,2;"."
;AT 15,29;"▤";AT 1,1;"G"
```

```
305 FOR F=1 TO 15
310 FOR G=1 TO 29
315 PRINT AT F,G;
320 IF PEEK (PEEK 16398+256*PEE
K 16399)<>23 THEN GOTO 340
325 LET X=INT (RND*5)
330 LET A$=CHR$ (((X=0)*8)+((X=
1)*27)+((X=2)*46)+((X=3)*27)+((X
=4)*27))
335 PRINT AT F,G;A$
340 NEXT G
345 NEXT F
350 POKE 16418,0
355 SLOW
360 GOSUB 9100
370 PRINT AT 23,0;"MOVE,WAIT OR
SAVE ?"
375 LET A$=INKEY$
380 IF NOT (A$="M" OR A$="W" OR
A$="S") THEN GOTO 375
385 IF A$="S" THEN GOTO 9990
390 PRINT AT 23,0;S$( TO 32)
395 IF A$="M" THEN GOTO 425
400 IF T<5 THEN LET E=E+.5
405 IF T<5 THEN GOTO 418
410 LET T=T-5
415 LET E=E+2
418 LET A=1
419 GOSUB 9100
420 GOTO 915
425 PRINT AT 23,0;"LEFT-5,DOWN-
6,UP-7,RIGHT-8 ?"
430 LET A$=INKEY$
435 IF NOT (A$="5" OR A$="6" OR
A$="7" OR A$="8") THEN GOTO 430
437 PRINT AT 23,0;S$( TO 32)
440 LET AAA=(A$="6")-(A$="7")
445 LET BBB=(A$="8")-(A$="5")
450 PRINT AT AA+AAA,BB+BBB;
455 LET Z=PEEK (PEEK 16398+256*
PEEK 16399)
460 IF Z<>128 THEN GOTO 485
465 PRINT AT 22,0;"THICK WALL,Y
OU BANG YOUR NOSE,  YOU CAN NOT
GO THAT WAY:-         "
470 IF INKEY$="" THEN GOTO 470
475 PRINT AT 22,0;S$
480 GOTO 370
485 IF Z<>27 THEN GOTO 515
486 PRINT AT 23,0;"OPEN DOOR,YO
U WALK THROUGH:-"
487 IF INKEY$="" THEN GOTO 487
488 PRINT AT 22,0;S$
490 GOTO 610
515 IF Z<>46 THEN GOTO 575
520 PRINT AT 23,0;"CLOSED DOOR,
";
525 FOR A=1 TO 4
530 IF I$(A)="K" THEN GOTO 550
535 NEXT A
540 PRINT E$;"KEY:-"
545 GOTO 470
550 PRINT K$;"KEY:-"
553 LET E=E-.5
555 IF INKEY$="" THEN GOTO 555
560 PRINT AT 23,0;S$( TO 32)
565 PRINT AT AA+AAA,BB+BBB;"."
570 GOTO 450
575 PRINT AT 23,0;"THIN WALL,";
580 FOR A=1 TO 4
585 IF I$(A)="H" THEN GOTO 600
588 NEXT A
590 PRINT E$;"HAMMER:-"
595 GOTO 470
600 PRINT K$;"HAMMER:-"
603 LET E=E-.5
605 GOTO 555
610 PRINT AT AA+(AAA*2),BB+(BBB
*2);
611 LET L=PEEK (PEEK 16398+256*
PEEK 16399)
612 IF L=169 THEN GOTO 670
613 IF L=171 THEN GOTO 780
614 IF L=170 THEN GOTO 2000
616 LET B=INT (RND*2)
617 IF A=0 AND AA<>2 AND BB<>2
AND RND>.35 THEN GOTO 665
618 LET A=INT (RND*6)
619 IF A=0 THEN GOTO 665
620 PRINT AT AA,BB;" "
630 LET AA=AA+(AAA*2)
640 LET BB=BB+(BBB*2)
650 PRINT AT AA,BB;"G"
655 LET E=E-.5
660 GOTO 910
665 IF B=0 THEN GOTO 780
670 PRINT AT 22,0;"THE ROOM IS
DARK,           ";AT AA+(AAA*2),BB
+(BBB*2);"■"
680 FOR F=1 TO 4
690 IF I$(F)="T" THEN GOTO 750
700 NEXT F
710 PRINT AT 23,0;E$;"TORCH:-"
720 IF INKEY$="" THEN GOTO 720
730 PRINT AT 22,0;S$
740 GOTO 370
750 PRINT AT 23,0;K$;"TORCH:-";
AT AA+(AAA*2),BB+(BBB*2);" "
755 LET E=E-.5
760 IF INKEY$="" THEN GOTO 760
765 PRINT AT 22,0;S$
770 GOTO 620
780 PRINT AT AA+(AAA*2),BB+(BBB
*2);"■";AT 22,0;"THE ROOM HAS NO
FLOOR,
790 FOR F=1 TO 4
800 IF I$(F)="P" THEN GOTO 870
820 NEXT F
830 PRINT AT 23,0;E$;"PLANK:-"
840 IF INKEY$="" THEN GOTO 840
850 PRINT AT 22,0;S$
860 GOTO 370
870 PRINT AT 23,0;K$;"PLANK:-";
AT AA+(AAA*2),BB+(BBB*2);" "
875 LET E=E-.5
880 IF INKEY$="" THEN GOTO 880
890 PRINT AT 22,0;S$
900 GOTO 620
915 LET A=INT (RND*13)+1
918 IF A=13 THEN GOTO 1200
920 GOTO 920+(10*A)
930 FOR F=1 TO 4
931 IF I$(F)="H" THEN GOTO 934
932 NEXT F
933 GOTO 1200
934 PRINT AT 21,0;"YOUR HAMMER
HANDLE HAS BROKEN.";AT 22,0;L$
935 IF INKEY$="" THEN GOTO 935
936 PRINT AT 21,0;S$
937 LET I$(F)="-"
938 GOSUB 9100
939 GOTO 1200
940 FOR F=1 TO 4
941 IF I$(F)="T" THEN GOTO 944
942 NEXT F
943 GOTO 1200
944 PRINT AT 21,0;"YOUR TORCH B
ATTERY IS FLAT.";AT 22,0;S$
945 GOTO 935
950 FOR F=1 TO 4
951 IF I$(F)="K" THEN GOTO 954
952 NEXT F
953 GOTO 1200
954 PRINT AT 21,0;"YOU FIND YOU
R KEY IS A PIANO KEY";AT 22,0;L$
955 GOTO 935
960 FOR F=1 TO 4
961 IF I$(F)="G" THEN GOTO 964
962 NEXT F
963 GOTO 1200
964 PRINT AT 21,0;"YOUR PLANK H
AS WOOD-WORM.";AT 22,0;L$
```

```
965 GOTO 935
970 FOR F=1 TO 4
971 IF I$(F)="F" THEN GOTO 974
972 NEXT F
973 GOTO 1200
974 PRINT AT 21,0;"YOUR FOOD HA
S GONE OFF.";AT 22,0;L$
975 GOTO 935
980 FOR F=1 TO 4
981 IF I$(F)="D" THEN GOTO 984
982 NEXT F
983 GOTO 1200
984 PRINT AT 21,0;"YOUR DRINK H
AS EVAPORATED.";AT 22,0;L$
985 GOTO 935
990 FOR F=1 TO 4
991 IF I$(F)="B" THEN GOTO 994
992 NEXT F
993 GOTO 1200
994 PRINT AT 21,0;"YOUR BANDAGE
IS TORN.";AT 22,0;L$
995 GOTO 935
1000 FOR F=1 TO 4
1001 IF I$(F)="S" THEN GOTO 1004
1002 NEXT F
1003 GOTO 1200
1004 PRINT AT 21,0;"YOUR SPLINT
HAS SNAPPED.";AT 22,0;L$
1005 GOTO 935
1010 IF RND>.5 THEN PRINT AT 22,
0;"YOU FIND THE PASSWORD,IT IS "
;O$;"REMEMBER IT."
1011 FOR A=1 TO 30
1012 NEXT A
1013 PRINT AT 22,0;S$
1014 GOTO 1780
1030 PRINT AT 21,0;"YOUR ";R$;"
IS BROKEN"
1031 LET W=W-4
1032 IF W<1 THEN LET W=1
1033 PRINT AT 22,0;"YOU FIND A "
;W$(W);":-"
1034 LET R$=W$(W)
1035 IF INKEY$="" THEN GOTO 1035
1036 PRINT AT 21,0;S$
1037 GOSUB 9100
1038 GOTO 1200
1100 IF INT (RND*3)<>0 THEN GOTO
 1200
1110 PRINT AT 21,0;"YOU ARE TRAN
SPORTED BACK TO THE START:-";AT
AA,BB;" ";AT 1,1;"G"
1111 LET AA=1
1112 LET BB=1
1113 IF INKEY$="" THEN GOTO 1113
1114 PRINT AT 21,0;S$
1116 GOSUB 9100
1200 LET A=INT (RND*4)
1210 IF A=0 THEN GOTO 1440
1220 LET B=INT (RND*30)+1
1230 LET MS=INT (RND*(2.65*S))+1
1235 LET OO=MS
1240 PRINT AT 22,0;"YOU MEET A "
;M$(B);TAB 0;"STRENGTH=";MS;TAB
16;"FIGHT OR PAY ?"
1250 LET A$=INKEY$
1260 IF NOT (A$="F" OR A$="P") T
HEN GOTO 1250
1265 PRINT AT 22,0;S$
1270 IF A$="F" THEN GOTO 1300
1280 LET T=INT (T-(OO*RND))
1285 IF T<0 THEN LET T=0
1288 GOSUB 9100
1290 GOTO 1430
1300 IF S>0 AND I<5 THEN GOTO 13
50
1310 PRINT AT 22,0;"YOU ARE TOO
WEAK,YOU MUST PAY:-"
1320 IF INKEY$="" THEN GOTO 1320
1330 PRINT AT 22,0;S$( TO 32)
1340 GOTO 1280
1360 IF 1.2*MS>S AND RND>.4 THEN
 LET I=I+1
1370 LET MS=INT (MS-(((RND*2)+1)
*(S/1.75)))
1371 IF MS<0 THEN LET MS=0
1372 IF MS<.001 THEN LET MS=.001
1378 IF MS<.0005 THEN GOTO 1400
1380 LET F=F-(((RND*2)*(MS/3.5))
+.5)
1381 IF F<0 THEN LET F=0
1382 IF F<.01 THEN LET F=.01
1383 GOSUB 9100
1385 IF INT MS<=0 OR (S>1.8*MS A
ND RND>.5) THEN GOTO 1400
1390 PRINT AT 22,0;"THE ";M$(B);
" HAS A STRENGTH=";INT MS;AT 23,
0;"FIGHT OR PAY ?"
1398 GOTO 1250
1400 LET A=INT (RND*5)+1
1410 PRINT AT 22,0;"THE ";M$(B);
" IS DEFEATED";AT 23,0;"YOU FIND
 ";T$(A);" :-"
1420 IF INKEY$="" THEN GOTO 1420
1425 LET T=T+(INT (A*(1.25*(1+(O
O/15))+RND)))
1426 PRINT AT 22,0;S$
1427 GOSUB 9100
1440 LET A=INT (RND*11)
1445 IF A=10 THEN GOTO 1780
1450 IF A=0 THEN GOTO 1700
1465 IF A=9 THEN GOTO 1010
1470 PRINT AT 21,0;"YOU FIND A "
;O$(A)
1480 PRINT AT 22,0;"PICK IT UP O
R LEAVE IT ?"
1490 LET A$=INKEY$
1500 IF NOT (A$="P" OR A$="L") T
HEN GOTO 1490
1510 IF A$="L" THEN GOTO 1690
1520 FOR F=1 TO 4
1530 IF I$(F)="-" THEN GOTO 1680
1540 NEXT F
1590 PRINT AT 23,0;"WHICH ITEM W
ILL YOU DROP ?     "
1600 LET A$=INKEY$
1610 IF NOT (A$>="A" AND A$<="Z"
) THEN GOTO 1600
1620 FOR F=1 TO 4
1630 IF I$(F)=A$ THEN GOTO 1680
1640 NEXT F
1650 PRINT AT 23,0;"YOU HAVE NOT
 GOT A """;A$;""":-    "
1660 IF INKEY$="" THEN GOTO 1660
1665 PRINT AT 23,0;S$( TO 32)
1670 GOTO 1590
1680 LET I$(F)=O$(A,1)
1690 PRINT AT 21,0;S$;S$( TO 32)
1693 GOSUB 9100
1700 LET A=INT (RND*10)+1
1710 PRINT AT 22,0;"YOU FIND A "
;W$(A);AT 23,0;"PICK IT UP OR LE
AVE IT ?"
1720 LET A$=INKEY$
1730 IF NOT (A$="P" OR A$="L") T
HEN GOTO 1720
1740 IF A$="L" THEN GOTO 1770
1750 LET R$=W$(A)
1760 LET W=A
1770 PRINT AT 21,0;S$;S$( TO 32)
1775 GOSUB 9100
1780 PRINT AT 21,0;"USE OBJECT ?
 (Y/N)"
1790 LET A$=INKEY$
1793 IF A$<>"Y" AND A$<>"N" THEN
 GOTO 1790
1795 IF A$="N" THEN PRINT AT 21,
0;S$
1800 IF A$="N" THEN GOTO 360
1810 PRINT AT 22,0;"WHICH OBJECT
 ?"
1815 IF INKEY$<>"" THEN GOTO 181
5
1820 LET A$=INKEY$
```

```
1830 IF NOT (A$>="A" AND A$<="Z"
) THEN GOTO 1820
1840 FOR F=1 TO 4
1850 IF I$(F)=A$ THEN GOTO 1900
1860 NEXT F
1870 PRINT AT 23,0;"YOU HAVE NOT
 GOT A """;A$;""":-"
1880 IF INKEY$="" THEN GOTO 1880
1885 PRINT AT 21,0;S$;S$( TO 32)
1890 GOTO 1780
1900 IF A$="F" OR A$="D" OR A$="
B" OR A$="S" THEN GOTO 1930
1910 PRINT AT 23,0;"YOU CAN ONLY
 USE ■ ■ ■ ■ NOW:-"
1920 GOTO 1880
1930 LET I$(F)="-"
1940 IF A$="F" THEN LET E=E+3
1950 IF A$="D" THEN LET E=E+1
1960 IF A$="B" THEN LET I=I-1
1970 IF A$="S" THEN LET I=I-3
1974 IF I<0 THEN LET I=0
1976 PRINT AT 21,0;S$;S$( TO 32)
1980 IF RND>.6 THEN GOTO 1780
1981 GOTO 360
2000 PRINT AT AA,BB;" ";AT 15,29
;"G"
2001 PRINT AT 21,0;"YOU HAVE REA
CHED THE EXIT.WHAT  IS THE PASSW
ORD ?"
2010 GOSUB 3000
2015 PRINT AT 23,0;"          "
2020 IF A$<>Q$ THEN PRINT AT 21,
0;"WRONG,THE PASSWORD WAS ";Q$;"
     ";AT 22,0;"THE GUARDIAN WIL
L NOW BEHEAD YOU"
2021 IF A$<>Q$ THEN GOTO 9999
2025 PRINT AT 21,0;S$
2030 PRINT AT 21,0;"THANK YOU,NO
W PLEASE PAY THE","GUARDIAN THE
TOLL.:-          "
2035 IF INKEY$="" THEN GOTO 2035
2036 PRINT AT 21,0;S$
2040 IF NOT (T>=100) THEN PRINT
AT 21,0;"■,YOU HAVE NOT GOT ENOU
GH MONEY,THE GUARDIAN WILL NOW B
EHEAD YOU"
2041 IF T<100 THEN GOTO 9999
2050 LET T=T-100
2060 GOSUB 9100
2065 LET SCOR=T*W
2070 PRINT AT 21,0;"YOU HAVE ESC
APED THIS OLD HOUSE AND GAINED £
";T;" AND A ";W$(W);" AS A SOUVE
NIR.SCORE=";SCOR
2071 GOTO 9999
3000 IF INKEY$<>"" THEN GOTO 300
0
3005 LET A$=""
3010 FOR A=1 TO 4
3020 IF INKEY$="" THEN GOTO 3020
3030 LET A$=A$+INKEY$
3040 PRINT AT 23,0;A$;" "
3050 IF INKEY$<>"" THEN GOTO 305
0
3060 NEXT A
3070 RETURN
9000 CLS
9001 PRINT "    THIS OLD HOUSE
BY A.KIDD   "
9002 PRINT "INSTRUCTIONS:-"
9003 PRINT "YOU FIND YOURSELF TR
ANSPORTED TOAN OLD HOUSE,FROM WH
ICH YOU MUSTESCAPE.THERE IS ONLY
 ONE EXIT,"
9004 PRINT "AND IT IS GUARDED.TH
E GUARDIAN","WILL ONLY LET YOU P
ASS IF YOU","PAY HIM £100 TOLL A
ND TELL HIM  THE PASSWORD."
9005 PRINT " YOU WILL COLLECT MO
NEY(IN THE  FORM OF TREASURE)AFT
ER KILLING","MONSTERS.YOU WILL B
E TOLD HOW    WELL OFF YOU ARE IN
 THE FORM OF "
9006 PRINT "INJURIES,ENERGY,WEAP
ON,STRENGTH.YOU CAN ONLY FIGHT I
F YOU HAVE ASTRENGTH GREATER THA
N ZERO AND ","LESS THAN FIVE INJ
URIES.YOU MAY INCREASE YOUR ENER
GY BY EITHER"
9007 PRINT "CONVERTING MONEY INT
O FOOD, OR ","FINDING FOOD/DRINK
.YOU CAN HEAL","INJURIES USING B
ANDAGES/SPLINTS.PRESS ANY KEY."
9008 SLOW
9009 IF INKEY$="" THEN GOTO 9009
9010 CLS
9011 PRINT "IF YOU CANNOT FIGHT
YOU MUST PAYTHE MONSTERS TO GO A
WAY.","THE PASSWORD CAN BE FOUND
 AROUNDTHE HOUSE.ONCE FOUND YOU
MUST","REMEMBER IT [illegible].THE H
OUSE IS"
9012 PRINT "VERY OLD,SO TO ENTER
 SOME ROOMS YOU MAY NEED A TORCH
(IF IT IS   DARK),A PLANK(IF THE
 FLOOR IS   ROTTEN),A KEY(IF THE
 DOOR IS    LOCKED),A HAMMER(IF
THERE IS A  THIN WALL)."
9013 PRINT "YOU CAN ONLY CARRY F
OUR OBJECTS AND ONE WEAPON AT ON
E TIME,THE  BETTER YOUR WEAPON(W
ORK OUT HOW IMPORTANT IT IS)THE
GREATER YOUR"
9014 PRINT "AND THE MONSTERS STR
ENGTH AND   THE MORE TREASURE WO
N OR LOST.  PRESS ANY KEY."
9015 IF INKEY$="" THEN GOTO 9015
9016 CLS
9017 PRINT "ABBREVIATIONS="
9018 PRINT "■-EXIT","■-A DARK RO
OM","■-NO FLOOR","▒-THIN WALL","
I-LOCKED DOOR";
9019 PRINT ,"G-YOU","■-BRICK WAL
L","H-HAMMER","T-TORCH","K-KEY",
"P-PLANK","F-FOOD","D-DRINK","B-
BANDAGE","S-SPLINT",".-OPEN DOOR
"," -ROOM"
9075 PRINT ,,,,"-PRESS ANY KEY.:
-"
9080 IF INKEY$="" THEN GOTO 9080
9085 FAST
9090 CLS
9095 GOTO 260
9100 IF E<0 THEN LET E=0
9105 PRINT AT 17,0;"ENERGY=";E;"
  ","INJURIES=";I;"  ";AT 18,0;"
TREASURE=£";T;"  ","OBJECTS=";I$;
AT 19,0;"YOUR WEAPON IS A ";R$
9110 LET Z=E-I
9111 IF Z<0 THEN LET Z=.1
9115 LET S=Z*(1+(W/4))
9120 PRINT AT 20,0;"STRENGTH=";S
;"  "
9130 RETURN
9900 LET A=INT (RND*9)+1
9901 LET Q$=P$(A)
9902 LET R$=W$(1)
9903 LET I$="----"
9904 LET T=0
9905 LET I=0
9906 LET E=3
9907 LET W=1
9908 LET AA=1
9909 LET BB=1
9910 LET L$="SO YOU THROW IT AWA
Y:-     "
9911 DIM S$(64)
9912 LET E$="YOU HAVE NO "
9913 LET K$="YOU USE YOUR "
9914 RETURN
9990 LET A$="THIS OLD HOUSE"
9992 SAVE A$
9994 GOTO 375
9999 PAUSE 4E4
```

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ROTRONICS
WAFADRIVE

Floppy discs and the Spectrum

Is it possible? Ray Elder investigates

One late summer morning found me meandering towards Staines. In an issue of *ZX Computing* I said Technology Research Ltd. had not seen fit to send one of their disc drive interfaces for review. However since I wrote that, and before the issue reached the newstands, they had offered me one.

Needless to say they were quite indignant at what appeared to be a complete falsehood, but during the ensuing phone call they accepted my explanation and invited me to visit their premises. Well, a chance of a day out was not to be missed, and so off I went.

The Staines central trading estate was well signposted and easy to find. It is a large, sprawling complex of offices and warehouses and a great deal of activity was taking place.

I was directed to TRL's office where I was met by Mr. Rutherford the general manager, a pleasant gentleman with a wealth of experience in marketing and who is certainly nobody's fool. He introduced me to Steve Tam who is the marketing director and to Steve Mok, managing and technical director and who is the inventor behind their products.

The workshop is just what you would imagine such a place to be, racks of components, strange looking half finished gadgets and a steady hum of activity. Everything is done to a high degreee of accuracy, an automatic flow soldering machine has been purchased to ensure the most reliable soldering and to remove the chance of dry joints.

I had asked for a loan of an interface, but here Mr. Rutherford showed his business acumen and gave us one, as he said; "If you have it on loan you'll mention us once in your review, if you have it permanently then you'll be able to try it out with the latest devices as they are produced and keep mentioning it with regard to compatibility." Regular readers will recognise this as being true as I'm always mentioning the ZX Lprint 111 interface and DK'Tronics keyboard!

Merge

Back at the office I blythely mentioned that I had a disk interface and asked if there was a spare drive I could use. "What type? What connector? What DFS or DOS?" the experts asked.

"No idea" I said, "don't you just plug it in?"

The gales of derisive laughter at my ignorance somewhat dampened my confidence. As it turned out there wasn't one there anyway. So I contacted some of the companies who sold disk drives, the reaction was much about the same but also there was a feeling of disbelief. A disk drive for a SPECTRUM???

Eventually I phoned Viglen, their attitude was similar at first but soon changed to one of interest and they agreed to provide me with a drive. By now I was able to inform them that it was a standard Shugart connector — I'd read the interface manual!

Verify

Sure enough, two days later, a huge parcel arrived inside of which, and taking up approximately 1/20 the space but very well protected, was the disk drive.

Plug the interface into the back of the Spectrum, a tight fit normally, but with the DK'tronics keyboard very much so. In the end I used the Currah micro slot extender/port divider between the interface and the Spectrum, a much better fit all round. The interface has a full port at the rear and I tried the ZX Lprint 111 centronics interface there first. It worked but the overall depth of the system was now nearly 3 times that of the Spectrum! I found that is still worked fine in the top of the Currah slot so I left it there and connected the PRISM VTX 5000 Prestel/Micronet telephone system to the back. Plug in the disk drive connector cable to the socket on the right side of the interface, plug in the Spectrum power supply to the special socket on the left of the interface, held my breath whilst keeping my fingers crossed and switch on . . .

List the TRL interface

The B Disk interface, as it's called is a large black ABS box which lies flat and plugs into the rear port of the Spectrum, a full through port is provided as well as sockets for the Spectrum PSU and the drive cable.

It is a nice looking unit and as was to be expected, the component layout and soldering was tidy and neat.

The accompanying manual is a joy to read, I read it first while waiting for the drive to arrive



and could understand it without having to have the thing working in front of me to experiment on.

In a clear and concise manner each of the functions are explained, all the standard SAVE and LOAD formats are provided plus a facility to auto run machine code by specifying its run address as a third parameter when saving. Verify is not supported and this worried me at first. However, after extensive use, I can honestly say that I've never had a failed SAVE.

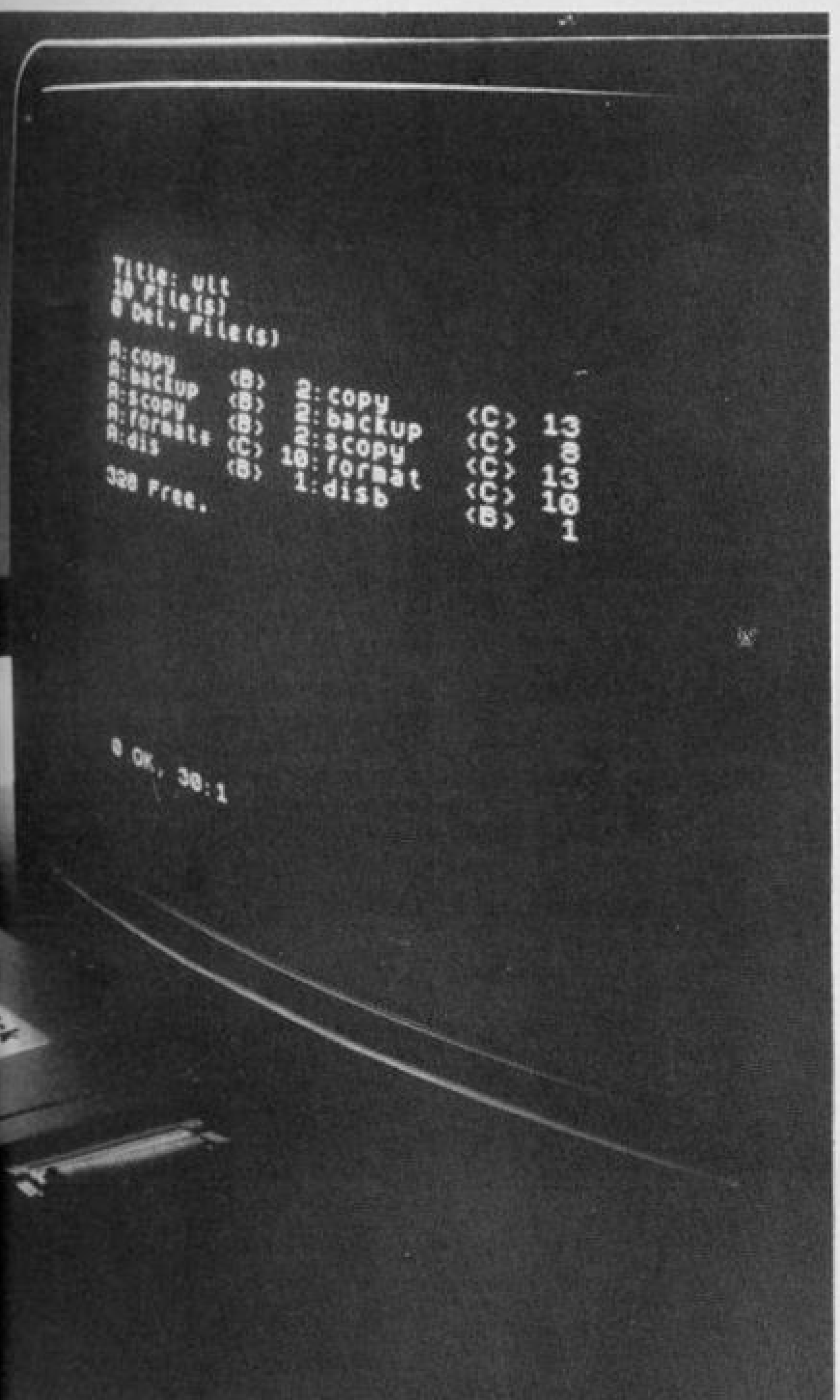
Some Microdrive commands are used, ERASE, CAT and MOVE to tidy up the disk, and up to four drives can be controlled from the interface.

On power up the interface is automatically brought in, the TRL notice is displayed and the disk password is requested. Each disk used can be protected by its own password. Once this is entered then the interface cursor is displayed, you can then utilise the disk commands or, by entering RETURN, go into Basic.

The Microdrive file system is operated by the Streams and the functions OPEN and CLOSE are not used. Steve said he's working on it, but I can see no immediate necessity as, to my knowledge, there is no commerical software using it and there are many ways of getting around it.

A useful device is the use of PEEK and POKE in disk commands which will allow you to have random access to any sector of the disc, a competant programmer could make use of this to access the 255 bytes for filing.

The disk commands can be accessed from within both Basic programs and machine code programs. Brief but full instructions are given in the manual.



Viglen disk drive

Viglen are essentially a computer supplier and were interested in the idea of linking a disk drive to a Spectrum, I got the impression from some companies that they couldn't be bothered with such a lowly computer.

Viglen have a large range of drives available at a large range of prices, but the one I asked for was a very simple, 40 track, single sided drive plus built in PSU.

The one supplied was the TEAC FB501 and bore their legend. The cost for this unit is £159.00.

The drive itself has a smart, long thin cream case with a black front. disks are inserted and a lever secures them, apart from a slight rumble as the drive starts and stops, operation is almost silent.

The case dimensions are, 146x41x209mm. and it weighs 1.4Kg. ie. It's bigger and heavier than the standard Spectrum! There's not much to say about the disk drive except that is has performed perfectly and to recommend the company to you as they were very helpful.

Run

CRASH!! Oh dear; however the problem was soon traced down to the incompatability of the VTX 5000 and the interface. Both wanted to initialise and operate on power up.

TRL were again helpful and suggested a simple modification which would overcome this. In effect, to cut out the auto start up all that is needed is a small, single-pole, two-way switch. They offered to modify my interface and said that for a small charge they will fit it to anyone's interface if required. It seems a pity that it couldn't have been built in as standard.

After that all worked perfectly.

The interface uses an incredible 128 bytes of the Spectrum RAM, and, apart from the usual problems which all microdrive owners trying to convert programs encountered, getting programs onto disk was simplicity itself.

Programs which were written in a professional manner for serious purposes were obviously provided with suitable documentation which made it easy.

Tasword 11, probably the most widely used and professional word processor was converted in twenty mins. (including 4 mins loading in from tape: disk load time 8 secs.)

Masterfile from Campbell systems, the most versatile filing program I have so far seen for the Spectrum also transferred as if it was designed for disk.

So I tried Jet Set Willy. No problem!

Here is a comparison:

Jet Set Willy loading times

Tape	4.30 mins.
Microdrive	9.50 to 45.15 secs, depending one tape position.
Disk	11.10

REM

TRL demonstrated the interface working with the Sinclair Interface 1. It is fully compatible with it, so that the RS232 and networking facilities can be used.

This is particularly useful in an educational situation as it means that several Spectrums can have use of a single disk drive through a central controlling Spectrum.

The latest device from TRL. is a Centronics interface for the QL which plugs directly into the RS232 socket. This should cost around £45.00 inc. VAT and on the production model I saw the unit was built into a connecting cable.

A similar unit is planned for the Spectrum Interface 1 RS232 port and should be available soon.

Output

Very impressive indeed, but also expensive. at £85.00 for the interface plus £159.00 for the drive (£244.00) this is not likely to be the system for the occasional user.

Indeed, if your main use is games and all you want is to get at those aliens quicker then the Microdrive is more than adequate. A disk system would be a waste of money in this case.

However, if you take your hobby seriously or use your Spectrum for any business purpose, then this system is well worth considering. In the long run the price of disks compared to that of microdrives — £1.90 to £4.95 — is worth noting.

Disks, although not the perfect storage medium by any means, have been around for a while and the drives are well tested and usually reliable.

And finally, if you get something like a disk drive it is almost certainly going to be compatible with another computer if and when you upgrade from your Spectrum, whereas the Microdrive almost certainly will not.



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Spectrum Arcade

David Harwood gives us the low-down on some high-scoring arcade games

Combat Lynx by Durell Software

Having unwrapped my bundle of tapes and glancing through, I thought that I would start off with the best of the bunch. **Combat Lynx** by **Durell** for the 48K Spectrum, comes in a smart plastic case, which is more like a video cassette case than a software box, with a battle picture on the front, which should attract the punters.

I was more attracted to the note on the back of the case. "£100 Reward", if my copy of the game did not have a blue plastic cassette body with the word 'DURELL' embossed on it. Well folks, I haven't moved so fast in all my life, but alas, my tape was not forgery and no £100. I think that this is a brilliant idea to beat software piracy, which is bringing some firms down under and I seriously hope that many other companies will follow suit.

Combat Lynx is described as an air-to-ground battle simulation game and is written in pure, 100% machine code. The manual reads '. . . . probably the most comprehensive 'real time' battle simulation ever written' (does this remind you of a lager advert?).

The idea of the game is to protect your bases from being attacked by the enemy and also to stop yourself being blown-up in mid-air.

At the beginning of the game the user has the option to redefine they keys and save or load score and key definitions. The skill level then needs to be selected between one and four, with four being the hardest and with more bases to look after. *Your* base 0 has luckily got an endless supply of fuel, weapons and the magical touch of revitalising injured 'troops.

Enemy vehicles will slowly attack all your bases, unless stopped by allied vehicles or yourself. As all you supplies are at base '0', the enemy will eventually arrive there and completely wipe it out in one fell swoop, leaving you totally disarmed as weapon supplies an injured persons cannot be recuperated.

You control the helicopter, which at the start of the game is hovering above base 0 and by gently tapping the 'down' key, you land at Base 0 and are presented with a set of screens in order to select weapons and troops. Passing through the screens, personnel may be picked up, injured personnel dropped and various weapor.s collected. There are six types of weapons at your disposal, each having different technicalities. The more weapons and personnel that are carried the more fuel is automatically dropped as there is a maximum weight allowed on board.

There are mines, which can be strategically placed around your bases to prevent a land attack on them: there are heat-seeking missiles, wire-guided missiles and three unguided missiles.

The intelligence map is a map of the battlefield with the lower ground in different colour to the higher ground and all the bases and vehicles, both allied and enemy, are represented by symbols. It is advised that you do not blow up the allied vehicles as you will definitley need all the help that you can get.

At any time the co-ordinates of all bases can be found out, thus by using the map the general direction may be formed. The map is examined by using the cursor keys with North always pointing upwards.

As well as all this there is also a message screen. The informer of when your bases are under attack and also when they have been totally wiped out, as well as any other appropriate messages. Fuel, speed, temperature guages amd a compass are all present in order for you, the helipcopter pilot, to survive and win this war.

The helipcopter, seen from behind, is easly controlled although a flicking of the flight screen occurs when you turn more than 45 degrees in order to put you at the rear of the helicopter again. This can put you off at first, but in no way does it hinder your game as there isn't any delay in restoring the flight image. The weapons are fired first of all selecting the desired system, pressing the weapon's sight key, lining up the black cross and finally pressing the fire button. This process can be too long if the enemy is in sight, by the time this weaponary process has ben affected, the enemy has disappeared. This is why I found the heat-seeking and wire-guided missiles most useful, as there is no real need to activate and line up the weapons sight.

An excellent game, which kept me (moderatley) awake till the early hours of the morning, that can be enjoyed by all. You are placed in the centre of a real-time battle situation and are your own boss as to how you may win the battle.

The game is not for the very young or the elderly, but even if you come in the middle of the above range, I am sure that you will find this simulation no easy task; The icing on the cake I suppose was the sound, which can be turned off and on, and is as close as any micro can get to a realistic helicopter's noise.

So, all in all brilliant graphics, outstanding simulation — an excellent game.



INSTRUCTIONS — 85%
PRESENTATION — 95%
ADDICTABILITY — 95%
VALUE — 95%
ZXC FACTOR — 10

Where the ZXC Factor is a mark out of ten representing whether I would buy the game.

Dragonfire by Cheetahsoft

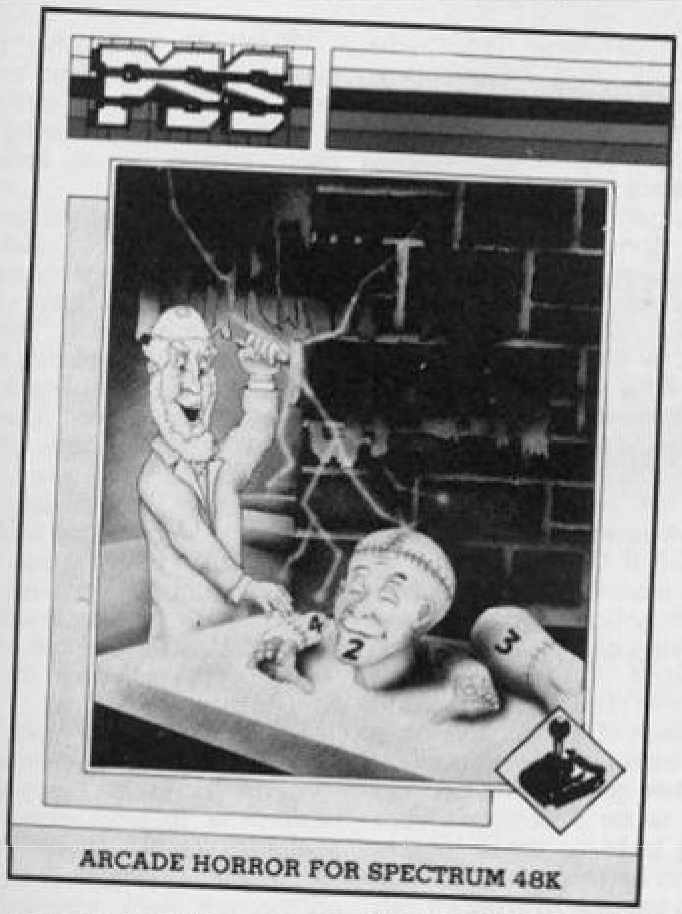
You are Young Prince William, whose laborious chore is to recover the nation's treasure from the castle, guarded of course by an evil dragon. As the treasure is in the castle, the Prince needs to get into the main room of the castle via the drawbridge. So the Gallant Prince sets off along the drawbridge dodging fast-moving fireballs. Quite an unfair task for such a young fellow.

The controls are fairly simple, using the cursor keys to move left and right, 6 to duck under the fireballs and 0 to jump over. The game is joystick compatible with the Cheetah R.A.T., Kempston or Interface 2.

Once inside the castle, the cursor keys will move young Willy in the desired direction in order to pick up the stolen treasure. Once this screen is completed, the game goes back to the first screen where the level of play is automatically increased and the Prince has to get into the castle dodging the fireballs again.

Inside the castle, as promised, I expected to find a dragon, but instead it looked more like a crocodile. This dragon moves along the end wall breathing out fireballs. Occasionally, when struck by a fireball, the body of the Prince was not erased and the game continued with a new William. This is a small bug, but as playing progressed a far larger one occurred. If the Prince stayed alongside two of the walls or in two of the corners, the fireballs just went straight through him and nothing happened at all. Let's hope that this is cleared up in the final version. These bugs are quite surprising as with only two screens and 48K of RAM I would have thought they could have been extensively checked.

The graphics are alright and clear but nothing special, but on



the whole I found it a no-go game.

INSTRUCTIONS 80%
PRESENTATION 65%
ADDICTABILITY 55%
VALUE 60%
ZXC FACTOR 5

Frank N Stein by PSS

Game number two in the list is **FRANK N STEIN by PSS** and is the type of polished game expected to come from such a good software house. The idea is the same as Manic Miner, zooming round the screen picking things up. This time not light bulbs but. . . . yes, parts of a monster's body. It is your task as the mad, mad professor (I wonder if he was intended to bear a resemblance to Sir Clive?) to collect and assemble all seven parts of the body and then make it come alive in order to get to the next screen. This may sound easy, but to add to the difficulty of your mission, the body must be collected in the correct order and not in any old fashion and the pieces are not always in the most easiest or accessable place.

On the first screen the professor has to grab the right chest and then immediately slide down a rope, else the gun successfully kills you, which is just one example of lots of hair raising and adrenalin pumping action that is to follow.

The jumping to get to different floors is not as easy as in Manic Miner as the professor needs to be exactly positioned over a spring to jump up a rope or to slide down before activation can take place. I found it easier to walk past the spring with the jump button held down at the same time, so at the right moment the professor would jump and no time would be lost. Incidentally, the control keys are well placed and the game is joystick compatible.

Some thought needs to go into some movements. How on earth is the proffesor going to grab a leg (for example without being squashed by a barrel or get hold of an arm without being poisoned by the lobster.

After each body-collection screen there is just a straighforward (?) obstacle course. This is great fun as you manoeuvre the Professor to the top of the screen in order to activate the monster again before going in to the next room in FRANK N STEIN's lair.

The obstacle course is more enjoyable than collecting the body as a direct plan of action to be adhered to else the ball may fall on your head or the crabs, lobsters, spiders, barrels, mice, crocodiles, pumpkins, bats, snails. . . . (the list is endless) may get you.

Another problem is the ground, which is not always as sound as it may seem. Ice is strategically placed and is great fun to watch as the Professor slips and slides. So also are the green patches of grass, slowing the movements of the Professor down greatly as he ambles across, admiring the view, and the light bulbs, causing an electric shock and finally the transformers, which delay you greatly as they beam you to their side.

All these and more go forward to make the game exciting, intelligent, fun to play with faultless graphics and sound. A must.

INSTRUCTIONS 70%
PRESENTATION 100%
ADDICTABILITY 100%
VALUE 100%
ZXC FACTOR 10

Jump by Unique

A game that I have been looking out for at the software stands that seem to appear in all the stores now has finally arrived. - **JUMP**, by **Unique**, is an arcade type game where you are in control of a man climbing his way up a tower block of flats. You have six controls to move either arm or leg and to move left or right. This is far too many for keyboard operation and unless you possess nimble fingers, you may find it quite a task. I think it would have been a good idea to include a joystick option, especially as this game is directed only to the arcade game enthusiast.

Controlling your fingers you must climb up the tower block, keeping an eye open for the windows, which musn't shut or close as you will find yourself falling to the ground. These windows are opened and closed by mad apes, who also throw plant pots at you in an effort to get you off their tower block.

An interesting point to note is that in the instructions we are told that apes have overtaken the tower block and at the introduction screen, we see an ape appearing at the window, but as soon as the game starts, Darwin's Theory of Evolution takes place and all the apes have changed into men.

The flower seemed to come at incredibly random moments, as quite often there is no chance of escape. This certainly made the game more of a challenge — not to be beaten by these apes (or men).

The music is good and the very detailed and smooth graphics are excellent, although they can get a bit boring after a time. This game, though, is a sure must for any arcade freak (or window-cleaner).

INSTRUCTIONS 80%
PRESENTATION 85%
ADDICTABILITY 80%
VALUE 80%
ZXC FACTOR 7

Eights by Atlantis Software

Next, we come to **EIGHTS**, by **ATLANTIS** Software and is the only game out of the whole bunch that is not strictly an arcade style game.

EIGHTS is an easy to learn card game of strategy for two players — you and the computer. The computer is of course master dealer, scorekeepr and opponent. We are told that the computer does in no way cheat, he just sees how many cards you've got and no further and if he did cheat, he would win every time. He plays too damn well anyway.

The game is as follows. Each player has seven cards. Player 1 discards his first card and then player 2 must follow the same suit or denomination as the card just played. If the player cannot go, he must draw cards from the deck until he can, or until no more cards are left. There is no limit to the number of cards that you may draw from the pack, so if you want to cheat . . .

Eights are played as wild, so if you lay down an eight, the suit can be changed so the player can plan out his moves and hopefully get rid of all his cards before his opponent and thus win a round. The score of each round is determined by the value of the cards in the defeated hand, with eights worth 50 points as they are so valuable. The overall winner is the first one to a hundred, but the computer will not give up easily.

The simple instructions will enable any anti-card game supporter to reverse his ways and get addicted. On your turn, you enter first of all the value of the card — eg. A for Ace, Q for Queen, 6 for Six etc. and then the suit — H for Hearts, C for Clubs and so on. The computer then checks that this card exists in your hand. If it does then the computer takes his go, and so on. If you cannot go, by simply pressing D you draw a card from the pack or if there are no cards left, X to skip your turn.

The played cards are represented in graphic form at the centre of the screen and your hand is shown at the bottom, just detailing the cards. The cards are good, although not as sharp as they could have been and also the suits could have pointed both ways up as in real playing cards and not just upwards as on the screen.

Some neat little tricks are included, with BEEPing to remind you that it is your go, the sounds of the shuffling and dealing of the pack and the four levels of ▶

play make Eights an exciting and intelligent game that is hard to stop playing once started. The computer plays a skilled game, even at the easiest level. A good buy for any card gamester. The good thing about it is that you don't have to beg somebody to play cards with you — just switch on the computer and TV, get a couple of drinks ready and you're away.

INSTRUCTIONS	100%
PRESENTATION	90%
ADDICTABILITY	90%
VALUE	90%
ZXC FACTOR	9



World Cup by Artic Software

Now for all you football fanatics, **World Cup** by **Artic Software** the game that you have waited for and no doubt had many sleepless nights, hoping that it would appear soon.

The game is for up to nine players and is a simulation of real soccer. Having selected the number of players and the desired teams out of a choice of 40, the action begins with either a practice mode or the full league.

As the players run onto the pitch, the cheering crowd are serenaded with various tunes — Match of the Day, I'm Forever Blowing Bubbles, When The Saints, Nice One Cyril (but only after a goal), which also play through the game. I was grateful for the sound off key as Spectrum sound can sometimes get a bit grating.

The game starts with player 1 kicking off, which is taken automatically, as are the goalie movements and throw-ins. If you play against the computer, be warned as it plays a good game and is very hard to beat.

Unfortunately, you do not have control of all your men on the pitch, only the man nearest the ball. This seems to be a great disadvantage at first, but the computer is generally quite good in controling the rest of your side, so it is not too much of a problem.

Unfortunately also there is no key-select option, which would have been welcomed as found the keys slightly uncomfortable to use. 1 for up, Q down, S right and A left with the bottom row for shooting. You are allowed to use either the Sinclair or Kempston joystick, which would be of great advantage as quicker action and movement will improve your game.

I found that both goalies were a little thick in that they just felt 'Lets get rid of the ball and kick it over the line' instead of passing to a specific player (remind you of any teams — I could name a few).

The speed of my players was not always as fast as they could have been. My footballer moved faster running at a diagonal than in a straight line. In spite of this, I thoroughly enjoyed all the games in the league and although the computer won and got his hands (hands?) on the Cup at the end of it all, my wife was knocked out in the first round (At least I got her to play at all!)

I did find a little bug: where the player had just been after a throw in, there was a gap on the line, which was refreshed quite soon afterwards. I would have thought that by the time the final version arrives in the shops this error will not occur.

Another polished game from Artic software, who managed to sneak in a couple of adverts above the crowd for their range of software and right at the end that wonderful phrase appeared 'and many more'. Well keep 'em coming as they can only get better.

INSTRUCTIONS	100%
PRESENTATION	95%
ADDICTABILITY	95%
VALUE	90%
ZXC FACTOR	9

Hyperblaster by M. C. LothLorien

Penultimately, we come to **Hyperblaster**, which is another asteroids type game. For many people this will obviously be an instant turn-off as the number of invader/asteroid type games on the market is innumerable and when you have seen one, you have seen them all. BUT — this game is different. This game seemed to have an unknown addictability force surrounding it and once sitting in the pilot seat of the G.P.4.U. hi-tech galaxy surveillance craft, it is very difficult to get off.

Unfortunately there was not a joystick option, which would have helped, but as the controls are simple to use — 1 for clockwise, 2 for anti-clockwise, 6 for thrust, 7 for fire and any key on the bottom row for Hyperblast there should be no problems.

HYPERBLAST is just a posh name for Hyperspace with effective sound and graphics as your G.P.4.U. is beamed to another position in the galaxy.

Having selected the skill level and either 1 or 2 players, the action begins. You have got 99 seconds to completely clear the first screen of aliens. There are 17 screens totally and each screen has got its own detailed shapes to be destroyed, from rotating balls to discs to diamonds to barrells etc. and each shape is peculiar to where it can be shot to be blown up.

There is not much more that I can say about this game, apart from its detailed graphics and arcade quality sound make it up into an exciting and addictive game. Great fun.

INSTRUCTIONS	80%
PRESENTATION	95%
ADDICTABILITY	100%
VALUE	95%
ZXC FACTOR	9

Pi-in 'ere by Automata UK.

The last of the bunch is **PI-IN'ERE** by **Automata U.K. Limited.** Automata is a trendy company, doing to computers what the SEX PISTOLS did to music.



PI-IN'ERE is another game where you have to go around screens and collect even the greatest 'Arcadist' among you, there should be no times of boredom.

A nice feature of the game is that after all your lives have been used up, the next game can be atarted from the last visited screen or from afresh. This is a great idea and I hope that many more software authors will follow, as sometimes it can be tedious going through all the same screens when wanting to discover new. You can also save or load the last position and high score, which will stop you from going through 59 screens to get to the 60th each time. A random life will also be granted, if the word EXTRA is lit up at the bottom of the screen.

The idea is as follows: You are Burt, who has been injected into the computer where his mission is to track down the elusive 'BIG BUG'. Isn't there one in every computer? As you go through many screens, collecting the various objects (I would love to know how milk-bottles managed to get into the computer, but you cannot trust electornics all the time. . .), your progress is hindered by minor bugs, each with their own degree of intelligence. The red bug is able to tunnel after you, whereas the other three cannot.

And then there are the EDIT keys, which when loosened from the walls, will give you an extra 30 points if they fall on a 'bug'. The only problem being that if they fall on you — BANG — a life gone. One unfair screen is when the EDIT key starts falling on you right at the beginning and you have to get out of the way immediately, or else!

With clear but not too detailed graphics, with good sound and joystick option, with the wonderful music of Just Kooks on the 'B-side' of the tape, a definite must for any computer game freak and lover of KOOL musik.

INSTRUCTIONS	90%
PRESENTATION	95%
ADDICTABILITY	95%
VALUE	95%
ZXC FACTOR	9

FOOTNOTE:

Having eventually finished the hobbit the other day, I thought I would at least be serenaded by something or the screen would flash, but instead a few words came up on the screen and that was it. I suppose I should be satisfied with my brilliance!!!!



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Artificial Intelligence on the QL

Artificial Intelligence is the science of making machines do things that would require intelligence if done by men. In this article, Tim Hartnell examines a simple artificial intelligence program for the QL

Artificial Intelligence (AI) is a fascinating field, where science fact interacts with science fiction.

Since the first computers were built, anguished debates have been fought over topics such as: Can a machine really think? What is the nature of intelligence, and will a machine ever be built which can partake of that nature?

Programs have been written which allow computers to display many actions which appear intelligent. Machines can now learn and reason, can talk with people, obey them and advise them. As achievements in the field accumulate, the question 'is the computer really thinking?' has taken a back seat. The approach nowadays tends to be along the lines of: 'It doesn't matter whether the computer is *really* thinking or not. So long as it can reach apparently intelligent conclusions, which work in practice, we can assume intelligence is present'.

There is a limited number of experts in the world on any one subject. It doesn't matter what field you're talking about — mending cars, mining for uranium, diagnosing human illness, sorting edible mushrooms from poisonous ones — there is a limit to the number of experts we have available.

Now while the world is not exactly crying out for more mushroom-sorting experts, there are areas of the world (most of it in fact) where there are not enough doctors. If intelligent computers could help overcome this shortage, it would be of immense benefit.

Using computers to act intelligently to assist or replace experts is one area of AI where great strides have been made in the past two decades. The name of the field is 'expert systems', in which the computer program is used to 'capture' the expertise of an expert in such a way that a non-expert can tap that information. The program in this article will demonstrate a simple expert system in use on the QL.

In its simplest form, an expert system is a series of IF/THEN statements. A diagnostic system could be as simple as this:

```
IF the patient is coughing
AND he has recently been soaked to the skin
AND then stood in a freezing wind for an hour
THEN the patient has a cold
```

Of course, one would hardly need an expert system to make a diagnosis like this.

It is interesting that many human experts do not know exactly how they reach their conclusions. Building an expert system for a particular area can be as much of a revelation to the human expert as to the person creating the knowledge base for the computer program. In the book *The Fifth Generation — Artificial Intellience and Japan's Computer Challenge to the World* (Feigenbaum and McCorduck) we read the very sad story of an expert who willingly explained his methods to a 'knowledge engineer' (the name given to those who draw out others' expertise and then modify it for the computer program) The expert was highly regarded (and well-paid) for his expertise, and was at first disbelieving when the knowledge engineer discovered the expertise could be reduced to a few hundred working rules of thumb'. From disbelief, the expert's view changed to one of depression, and finally he quit the field, a broken man.

While running our expert system (and developing your own) is hardly likely to have as dramatic effect on you as our human expert experienced, you will learn a great deal about how such systems are developed.

There are a number of successful systems around. They include DENDRAL which is able to work out facts about molecular structures from raw chemical data; EURISKO, which is able to learn as it works, which creates three-dimensional microelectric circuits; TAXMAN, which examines the tax rules in America and gives customers advice on how best to operate within the rules; and GENESIS, which allows scientists to plan and simulate gene-splicing arrangements.

I'm afraid we won't be getting into gene-slicing just yet, although we will be finding some interesting applications for our expert system, such as solving the everyday problem of telling the difference between a man, a horse and a sparrow.

Our system is called SPURT. Run the following program on your QL, and you'll see SPURT in action. It asks you three questions, and from them determines which of the three (the man, the horse or the sparrow) you were thinking of.

After setting the scene, with the line numbers up to 60, the real business of determining which creature you're thinking about begins, with the section of code from 170 to 290. You'll see in the part of the program from lines 310 to 350, the variable COUNT is set to zero at the start of the run, and incremented by one each time a 'yes' answer is given. Using this information, SPURT has no trouble deciding which creature you're thinking about (lines 250 through to 290). As you can see, it is a pretty simple program, but one which lays the foundation upon which expert systems could be built. From it, you can develop programs which — for example — could do things like predict the mean failure time of stressed metals. Use our framework, and try to develop your own expert system in a field of your choice.

This article is based on the books *Exploring Artificial Intelligence on your QL* and *Exploring Artifical Intelligence on your ZX Spectrum*. The books are £6.95 each, and are available from the publishers, Interface Publications, 9/11 Kensington High Street, London W8 5NP.

```
10 REMark =====
12 REMark SPURT
14 REMark =====
16 :
20 initialise
25 REPeat main_loop
30  PRINT: PRINT "I want you to think
 of"\"  a man"\"   a horse"\"     o
r a sparrow"
```




```
50  PAUSE 200
60  PRINT: PRINT
70  ask_questions
80  PRINT
90  PRINT "-------------------------
---------"
100  PRINT: PRINT "Press ENTER for an
other one , or"
110  PRINT "any key and then ENTER to
 quit"
120  INPUT q$
130  IF q$<>"": EXIT main_loop
140  CLS
150 END REPeat main_loop
152 STOP
154 :
160 REMark ===========
162 REMark definitions
164 REMark ===========
166 :
170 DEFine PROCedure ask_questions
180  count=0
190  PRINT "Does it have two legs?"
200  process_answer
210  PRINT "Can it walk?"
220  process_answer
230  PRINT "Can it fly?"
240  process_answer
250  PRINT "You were thinking of a ";
255  SELect ON count
260   =1: PRINT "horse"
270   =2: PRINT "man"
280   =3: PRINT "sparrow"
285  END SELect
290 END DEFine ask_questions
300 :
310 DEFine PROCedure process_answer
315  REPeat control
320   INPUT "        y or n   ";z$
330   IF z$="y" OR z$="n"
332    EXIT control
334   END IF
335  END REPeat control
340  IF z$="y": count=count+1
350  PRINT
360 END DEFine
370 :
380 DEFine PROCedure initialise
390  CLS #0
400  BORDER 7,4
410  PAPER 1
420  INK 7
430  CLS
440 END DEFine initialise
450 :
460 REMark =========
470 REMark END SPURT
480 REMark =========
```

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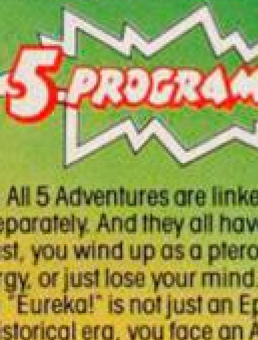
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Mini Bingo

No Big Prizes, but what a game! From the portfolio of R G Luxton in Solihull.

Mini Bingo is a game for four players in which the computer prints my version of a Bingo card for each of the players. Each card has ten random numbers which are unique to that game.

After a warning that the screen will go blank for about 30 seconds, you are asked to press "S" to start the game, and from then on the computer does everything until a winner is declared.

The numbers allotted to the cards are 'called' at random by the ZX81. If the number 'called' appears on the card, that number's 'blacked-out'. The first card which is completely blacked out is declared the winner, and the number of 'calls' required to win the game announced.

In addition to the winner of each game, the owner of the winning card requiring the least number of 'calls' at the end could be declared the "winner of winners". If someone claims that one of their numbers was 'called' but was not crossed-off on their card, or if you just want to go over the game again, then simply enter "CHECKLIST", whereupon the computer will print out a list of numbers used in the game, and a list of all numbers 'called'.

The program revolves around two number sorts, both of which randomly mix the numbers, and ensure that a number is not used more than once:

- Lines 260 to 310 Pick 40 numbers at random from an available 99 in order to fill the players' cards.
- Lines 895 to 1160 'shuffles' the 40 numbers and 'calls' each one as the program runs.

Why have I used two different number sort routines?

Interestingly, the first sort routine — which has a choice of any 40 numbers from an available 99 — is faster than the second sort which uses a string slicing routine. However, this soon becomes clogged up and can be very time-consuming. Conversely, the more sophisticated string sort — which randomises the previously selected 40 numbers — does this much faster, but is slower in selecting numbers in the first place, however wide or narrow the field may be.

As the numbers are 'called' the ZX81 counts them, with the first card to have its 10 numbers 'called' declared the winner.

The use of INKEY$ speed the game up a little, and provides an interesting and simple way to introduce flashing graphics into a program.

This program uses approximately 4K of RAM. An average game lasts about 5 minutes.

LOADing time is approx. 2½ minutes, and after RUN, the program goes into FAST mode for 30 seconds to set variables and to print graphics. After that it is fun all the way, so "Eyes down and look in . . . . . ."

```
  10 REM "ZX BINGO"
  20 REM IF CLAIMS OF ERRORS ARE
 MADE, KEY IN "CHECKLIST"(N/L)AT
 THE END OF GAME
  30 PRINT AT 0,5;"WELCOME TO ZX
 BINGO."
  40 PRINT AT 2,5;"------------
 -------"
  50 PRINT
  60 PRINT "FOR ZX BINGO, NEW CA
RDS ARE      PREPARED FOR EACH GA
ME, (NO      TWO ARE EVER THE SAM
E.)"
  70 PRINT AT 9,0;"THIS TAKES AB
OUT 30 SECONDS,     DURING WHICH
TIME THE SCREEN     WILL GO BLANK
."
  80 PRINT AT 14,4;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒"
  90 PRINT AT 14,6;"
     ";AT 14,6;"(PRESS S TO STA
RT)";AT 14,6;"
";AT 14,6;"(PRESS S TO START)"
 100 IF NOT INKEY$="S" THEN GOTO
 90
 110 FAST
 120 CLS
 130 LET S=0
 140 LET T=0
 150 LET O=0
 160 LET P=0
 170 LET B$=""
 180 LET C$="▒CARD▒▒CARD▒▒CARD▒▒
CARD"
 190 LET D$="A▒▒▒▒▒B▒▒▒▒▒C▒▒▒▒▒D
"
 200 LET E$="▒CARD▒▒CARD▒▒CARD▒▒
CARD"
 210 LET F$="A▒▒▒▒▒B▒▒▒▒▒C▒▒▒▒▒D
"
 220 LET G$="BINGO"
 230 LET H$="WINS"
 240 DIM R(40)
 250 DIM A$(40,2)
 260 REM SET CARD NUMBERS
 270 FOR N=1 TO 40
 280 LET A$(N)=STR$ INT (10+RND*
89)
 290 FOR J=1 TO N-1
 300 IF A$(N)=A$(J) THEN GOTO 28
0
 310 NEXT J
 320 REM SET FOR "CHECKLIST" STR
INGS
 330 IF N=1 THEN LET B$="A"
 340 LET B$=B$+A$(N)+"/"
 350 IF N=10 THEN LET B$=B$+"B"
 360 IF N=20 THEN LET B$=B$+"C"
 370 IF N=30 THEN LET B$=B$+"D"
 380 NEXT N
 390 REM PRINT CARD NUMBERS
 400 LET C=1
 410 FOR B=2 TO 23 STEP 3
 420 FOR A=6 TO 14 STEP 2
 430 PRINT AT A,B;A$(C)
 440 LET C=C+1
 450 NEXT A
 460 NEXT B
 470 REM PRINT CARDS
 480 FOR A=2 TO 15
 490 FOR I=1 TO 25
 500 IF A=6 THEN LET A=15
 510 PRINT AT A,I;"▒"
```

```
 520 FAST
 530 NEXT I
 540 NEXT A
 550 FOR A=4 TO 22 STEP 6
 560 FOR I=6 TO 14
 570 PRINT AT I,A;"■"
 580 NEXT I
 590 NEXT A
 600 FOR A=7 TO 13 STEP 2
 610 FOR I=2 TO 24
 620 PRINT AT A,I;"■"
 630 NEXT I
 640 NEXT A
 650 FOR A=1 TO 25 STEP 6
 660 FOR I=2 TO 14
 670 PRINT AT I,A;"▒"
 680 NEXT I
 690 NEXT A
 700 SLOW
 710 FOR L=1 TO 12
 720 PRINT AT 0,6;"▒▒ ZX ";G$;"
▒▒";
 730 NEXT L
 740 REM PRINT FLASHING TITLES
 750 SLOW
 820 REM REM PRINT CALLERS BOX
 830 PRINT AT 8,27;"▛▀▀▜";AT 9,2
7;"▌";AT 9,30;"▐";AT 10,27;"▙▄▄▟
"
 850 PRINT AT 18,1;"WELCOME BACK
....PLEASE"
 860 PRINT AT 19,1;"KEY ""S"" TO
 START GAME."
 870 PRINT AT 3,2;C$;AT 4,4;D$;A
T 3,2;E$;AT 4,4;F$
 875 IF NOT INKEY$="S" THEN GOTO
 870
 880 PRINT AT 18,1;"
        "
 885 PRINT AT 17,4;"  HERE WE GO
...,";AT 19,4;"    ** EYES DOWN
**    "
 895 REM SUBROUTINE TO"CALL" NUM
BERS
 900 LET T$=""
 910 LET M$=""
 920 FOR I=1 TO 40
 930 LET D=I
 940 LET M$=M$+CHR$ D
 950 NEXT I
 960 LET F=40
 970 FOR I=1 TO 40
 980 LET G=INT (RND*F)+1
 990 LET J$=M$(G)
1000 LET J=CODE J$
1010 PRINT AT 9,28;A$(J)
1020 LET T$=T$+A$(J)+"/"
1030 LET E=1
1040 FOR B=2 TO 23 STEP 3
1050 FOR A=6 TO 14 STEP 2
1060 IF A$(J)=A$(E) THEN PRINT A
T A,B;"  ";AT A,B;"  ";AT A,B;"■
■";AT A,B;"■■";AT A,B;"  ";AT A,
B;"  ";AT A,B;"■■";AT A,B;"■■";A
T A,B;"  ";AT A,B;"  ";AT A,B;"■
■";AT A,B;"■■"
1070 LET E=E+1
1080 NEXT A
1090 NEXT B
1100 PRINT AT 9,28;"  "
1110 GOSUB 1200
1120 LET K$=M$(1 TO G-1)
1130 LET L$=M$(G+1 TO LEN M$)
1140 LET M$=L$+K$
1150 LET F=F-1
1160 NEXT I
1200 REM SUBROUTINE FOR COUNTING
 CALLS FOR EACH CARD AND DECLARI
NG THE WINNER.
1210 IF J<=10 THEN LET S=S+1
1220 IF J>10 AND J<=20 THEN LET
T=T+1
1230 IF J>20 AND J<=30 THEN LET
O=O+1
1240 IF J>30 AND J<=40 THEN LET
P=P+1
1250 IF S=10 THEN GOTO 1300
1260 IF T=10 THEN GOTO 1320
1270 IF O=10 THEN GOTO 1340
1280 IF P=10 THEN GOTO 1360
1290 RETURN
1300 PRINT AT 8,2;G$;AT 10,4;"A"
;AT 12,3;H$
1310 GOTO 1370
1320 PRINT AT 8,8;G$;AT 10,10;"B
";AT 12,9;H$
1330 GOTO 1370
1340 PRINT AT 8,14;G$;AT 10,16;"
C";AT 12,15;H$
1350 GOTO 1370
1360 PRINT AT 8,20;G$;AT 10,22;"
D";AT 12,21;H$
1370 PRINT AT 17,4;"CONGRATULATI
ONS";AT 19,4;"THAT TOOK ";S+T+O+
P;" CALLS."
1380 INPUT U$
1390 IF NOT U$="CHECKLIST" THEN
GOTO 1260
1400 IF U$="CHECKLIST" THEN CLS
1410 PRINT "CHECKLIST"
1420 PRINT
1430 PRINT "NUMBERS IN EACH BOX,
(TOP TO BOTTOM, LEFT TO RIGHT):-
 ";B$
1440 PRINT
1450 PRINT "NUMBERS CALLED:- ";T
$
1460 STOP
```

Resistor Resistor

J P Roebuck from Huddersfield supplies all electronic constructors with this handy 16K colour band decoder

Although written for the ZX81 this program should work as printed on the Spectrum as well.

As most dabblers in electronics know, the value of a resistor is given by a set of colours printed on it's side. This program will decode the full four bands almost instantly!

Description

Lines	
10-20	print main heading
30-90	input the colours of the resistor
100-110	tell the operator to wait
120	goto the routine
130-200	print answer and rerun the programme
1000-1100	set up the variables
1110-1150	check first 3 inputs and define the answer
1160-1180	check the last input and define the answer
1190	let variable H equal the first 2 answers
1210-1230	let H equal the third answer as well
1240-1260	check if the answer is in mega, kila or ohms
3000-3010	define d$ as ohms
3100-3120	define d$ as kila ohms
3200-3230	define d$ as mega ohms
9000-9010	save and auto run

Variables

A$	input variable
B$	master variable to check A$ with
C$	first parts of the answer
D$	type size of the answer ie mega
H	the final answer
C$(4)	the tolerance

```
  10 PRINT "R O E B U C K  C O M
P U T E R S"
  20 PRINT ,,"      RESISTOR COLO
UR CODE."
  30 DIM A$(4,7)
  35 DIM S$(32)
  40 PRINT AT 10,0;"PLEASE INPUT
 COLOUR BAND NO. "
  50 FOR N=1 TO 4
  60 PRINT AT 10,30;N
  70 INPUT A$(N)
  80 IF A$(N)="          " THEN GOT
O 70
  90 NEXT N
 100 PRINT AT 10,0;S$
 110 PRINT AT 10,0;"PLEASE WAIT"

 120 GOSUB 1000
 130 PRINT AT 10,0;S$
 140 PRINT AT 10,10;H;" ";D$
 150 PRINT AT 12,10;"AT ";C$(4);
" PER CENT."
 160 PRINT AT 21,0;"PRESS A KEY"
 170 IF INKEY$="" THEN GOTO 170
 180 PRINT AT 10,0;S$;S$;S$
 190 PRINT AT 21,0;S$
 200 GOTO 30
1000 DIM B$(10,7)
1010 DIM C$(10,2)
1015 LET B$(1)="BLACK"
1020 LET B$(2)="BROWN"
1030 LET B$(3)="RED"
1040 LET B$(4)="ORANGE"
1050 LET B$(5)="YELLOW"
1060 LET B$(6)="GREEN"
1070 LET B$(7)="BLUE"
1080 LET B$(8)="PURPLE"
1090 LET B$(9)="GREY"
1100 LET B$(10)="WHITE"
1110 FOR F=1 TO 3
1120 FOR N=1 TO 10
1130 IF A$(F)=B$(N) THEN LET C$(
F)=STR$ (N-1)
1140 NEXT N
1150 NEXT F
1160 IF A$(4)="GOLD   " THEN LET
 C$(4)=STR$ 5
1170 IF A$(4)="SILVER " THEN LET
 C$(4)=STR$ 10
1180 IF A$(4)="BRONZE " THEN LET
 C$(4)=STR$ 20
1190 LET H=VAL (C$(1)+C$(2))
1210 FOR F=1 TO VAL C$(3)
1220 LET H=H*10
1230 NEXT F
1240 IF H<1000 THEN GOTO 3000
1250 IF H>=1000 AND H<1000000 TH
EN GOTO 3100
1260 IF H>=1000000 THEN GOTO 320
0
3000 LET D$="OHMS."
3010 RETURN
3100 LET D$="KILA OHMS."
3110 LET H=H/1000
3120 RETURN
3200 LET D$="MEGA OHMS."
3210 LET H=H/1000000
3230 RETURN
9000 SAVE "RESISTOR"
9010 RUN
```

The Spectrum Plus



Without the usual blaze of publicity, Sinclair Research slipped onto the market their latest production model of the Spectrum. It arrived unannounced at the office and was, even though rumours were rife, quite a surprise!

First impressions

On opening the box an impressive, and exciting looking, machine lay before us. Its style was very similar to the QL, squarer, and much more solid looking than the usual Spectrum, every inch a "real" computer. What wonderous electronics were hidden beneath the case? Perhaps an American TS2068 operating system?

The first thing to strike me was that the keyboard no longer consisted of the rubber pads which put off so many people, and that the colourful key legends had all been replaced by white letters on black keys.

Secondly, the user manual was different and although not so artistic on the cover, was full of colourful pictures and interesting looking examples, albeit somewhat thinner than the original.

Finally, the Horizons tape (as supplied with the ordinary spectrum) has been replaced with a cassette containing six, new, programs.

A close look

Examining the computer more carefully revealed that in fact it was the 48K Sepctrum PCB we know — housed in a new keyboard. This means of course that the wealth of Spectrum software will still be usable on the Spectrum+ much to the relief of many I would imagine!

All the Spectrum hardware peripherals will also be compatible, although due to the raised height of the case some units which have a "lip" to fit over the normal keyboard will not fit securely. This includes such established items as DK'Tronics, Kempston and Cheetah interfaces. It is, of course, fully compatible with the ZX Microdrives and the Sinclair Interfaces I and II.

So lets take a critical look, remembering that for roughly the same cost, £179.95, you could buy a Spectrum and a separate keyboard.

The keyboard

This appears (without dismantling the computer) to be the standard membrane type with rubber keys topped off by plastic keys. This actually works quite well, the action is firm and the keys spring back quickly. They feel good to touch and travel solidly down with the exception of the two CAPS SHIFT and the ENTER key which tend to wobble somewhat. The half size space bar however, is well balanced and it does not suffer from this.

To anyone used to using a typewriter the keys may seem a little quiet — no satisfying click — and they are a little close together for fast typing, but perhaps this is a matter of getting used to and only time will tell. The keys are, like the QL's, flat but with slightly raised, dished pads to them.

A nice touch is the addition of two rear legs which may be lowered to give the keyboard a slant forward. Of course if you have anything attached to the port at the back it then is left hanging in the air by its connector!

One impressive feature is the addition and choice of extra keys. The most obvious is the mini-space bar, but there are a total of 58 keys in all.

A double sized CAPS SHIFT key is provided at the bottom of each side of the keyboard, and the enter key is a large inverse L shaped key *a la* QL.

At each bottom corner a symbol shift key is provided and single key entry or access of True-Video, Inverse Video, Delete, Graphics, Extended (E) mode, Edit, Caps Lock, Break, ; " , . and the cursor keys is also provided. This layout makes programming much easier, and once you get used to it, it is a great advantage.

The extra cursor keys are nicely positioned for games players but unfortunately, because they are already Caps Shifted, won't work on many of the existing games using the cursor keys. Finally, on the left, tucked safely under the overhang of the top of the keyboard is a small button. This is the RESET button. When stuck in a game which has disabled the Break key, or when your computer locks up with that machine code routine, no longer do you have to keep pulling out the plug. Just press the

button! A great saving on the wear-and-tear of the Power socket.

The manual

This is a much better manual than the original. It's bright, well written, interesting and it starts with the setting up of your computer and then leaps straight in with simple programs.

Colour photographs have been used to show examples of the screen display at the important stages and the whole approach is geared to simple explanations. Some owners of Spectrums were keen to borrow the manual and try out some of the little programs. One person said, after trying the UDG section; "Oh! So that's how Binary and UDG's are related!" — and he has had his spectrum for nearly eight months.

Although the manual is a slimmer volume, as far as I can se all the information held in the original is included in this one. The only criticism I can think of is that experienced users may find it confusing to find out a specific item of information — ie. The hex code of a particular character.



In use

The keyboard is a great improvement, and the extra keys make programming much easier, but my tame touch typist found them unsuitable for typing at speed.

I found that although I've been using a Spectrum for as long as they've been available, the fact that keywords are printed in white ON THE KEY caused confusion. Finding some of them took a bit of searching and yet I thought I knew all their positions. Actually, they are laid out quite logically; command keywords and symbol shift keywords are on the dished part of the key and the old E mode green and red keywords are on the flat bit behind the key. Again perhaps time and practise will remove this problem.

If you play games and use the keyboard the the more positive action and dished tops are much better, although because some of the key positions have been adjusted, some of the games are more awkward to play.

If you use a joystick and interface then there is no difference!



Assessment

A beautiful looking machine which is a big improvement on the basic Spectrum. It is not perfect, but then what computer is! The manual is one of the best I've seen, especially for beginners, and that includes those for some very expensive machines.

Sinclair Research tell me that they have no plans to sell the keyboard separately — so that the old style Spectrums can't be upgraded — but that the manual will be on sale in most computer shops for £4.95.

Personally I think there are keyboards around that are as good, If not better, for about the same price as this one costs — especially if you want a specific feature such as the numeric keypads to be found on some. However for those who do not want the fuss of adding their own this is a good alternative. A fully keyboard owner was quite envious!

It seems that Sir Clive has listened to the critics and made an effort to modify his machine with their comments in mind. All things considered, I would say that the price is a little high for what you get. At around ten pounds less the Spectrum+ would be excellent value for money.

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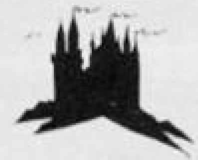
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The price, too, is almost unbelievable. As a "fit it yourself Eprom", complete with manual, it's just £25+VAT. Add £2 p&p UK (£5 Europe, £10 outside Europe) and send your order to the address below.

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Odds and ends, letters, and company info

SINCLAIR RESEARCH are busy as usual, far from cutting down on Spectrum production they are increasing it. In fact they are doubling production to 200,000 units per month by the end of the year.

Increases are also expected in flat screen TV and QL computer production to 20,000 and 50,000 units respectively.

It is nice to see the special software offer for new buyers of the Spectrum, especially as the programs in question were some of the best on the market. It's a pity us long-time supporters who have been with him since the ZX80 (and before) couldn't be given some kind of boost.

I suppose the "Expansion System" package may have been intended for us long timers, i.e. the Interface I, a Microdrive and four excellent software programs (Tasword II, Masterfile, Games Designer and 3 D Ant Attack).

Sometimes it makes you sick that you were one of the first in line to buy!

600 48K SPECTRUMS are being used by the automation and computing department of China's North East Technical College to enable their graduate researchers to learn Basic.

They were also provided with "an introductory library of software programs", including LOGO and Micro Prolog.

A nice letter from Software Farm

Dear Ray,

Following the success of "Forty Niner" and the imminent release of its follow-up "Rocketman", ZX81 readers might be interested to know of Software Farm's Software Club.

The club is specifically designed for ZX81 owners who otherwise get something of a raw deal. We simply aim, not to sell Software Farm tapes (as this sort of gimmick has proved to be unnecessary for this purpose), but to help ZX81 owners in general.

ZX81 owners who have joined clubs in the past have been inundated with information of Spectrum, BBC, Commodore etc., add-ons, news and general bits and bobs — but never a mention of the poor old ZX81. For instance "Where can you get a joystick that is compatible with the ZX81?" is the sort of question we are asked and can help with.

Unfortunately, we have to charge £2 per annum (or £10 life membership) which might be a little more than average for an owners club. In actual fact, this does not even cover the cost of the quarterly newsletter sent to members and is extremely good value for the service we offer. We are committed to giving individual service to our members, and have on several occasions spent a considerable amount of time tracking down the more obscure queries for a single member. A case in point being a member interested in the combination of ZX81, robots and FORTH.

I believe that you support the ZX81 to the full and I hope that you might be able to put some pressure on the editors of *ZX Computing* to allow you enough space to make the following point, with which I think you will agree. We have a very good and highly successful program already on the market, i.e. "Forty Niner" and a potential best-seller about to be launched. The trouble is, that once again the ZX81 owners gets a raw deal: every week we are swamped with letters saying that they have heard about "Forty Niner" and have tried to obtain it by trudging around all their local shops without success. Now while most of the major 'enlightened' distributors stock "Forty Nine" and will be doing so with "Rocketman", it has proved an impossible task to persuade the multitude of smaller distributors and dealers to stock this title. Perhaps, during the summer months when Spectrum programs are selling like dead frogs, it is not surprising that they will not stock ZX81 tapes, which they have been conditioned to believe will do even worse. This eventually harms the ZX81 user, who I know from experience is *dying* to buy — even during the summer!

Perhaps you could impress on them a feeling of self-help. Do not simply look at the shelves of your local shop for "Forty Niner" and the soon-to-be-released "Rocketman"... PESTER THE HELL OUT OF THEM if they don't stock it (or any other company's ZX81 tapes)!!! This will give the shop owner a better idea of what will sell and, in turn, the distributors confidence will grow in the machine as a whole. In the end this will benefit all concerned.

Keep up the good work!

Yours sincerely,
J.N. Chappell



Andrew Hewson at the Chicago Consumer Electronics Show. Far left: Andrew Hewson; Rod Cousens MD of Quicksilva to his right; Mark Eyles of Quicksilva second from far right; Ab Pandaal, MD of Kempston Micro far right.

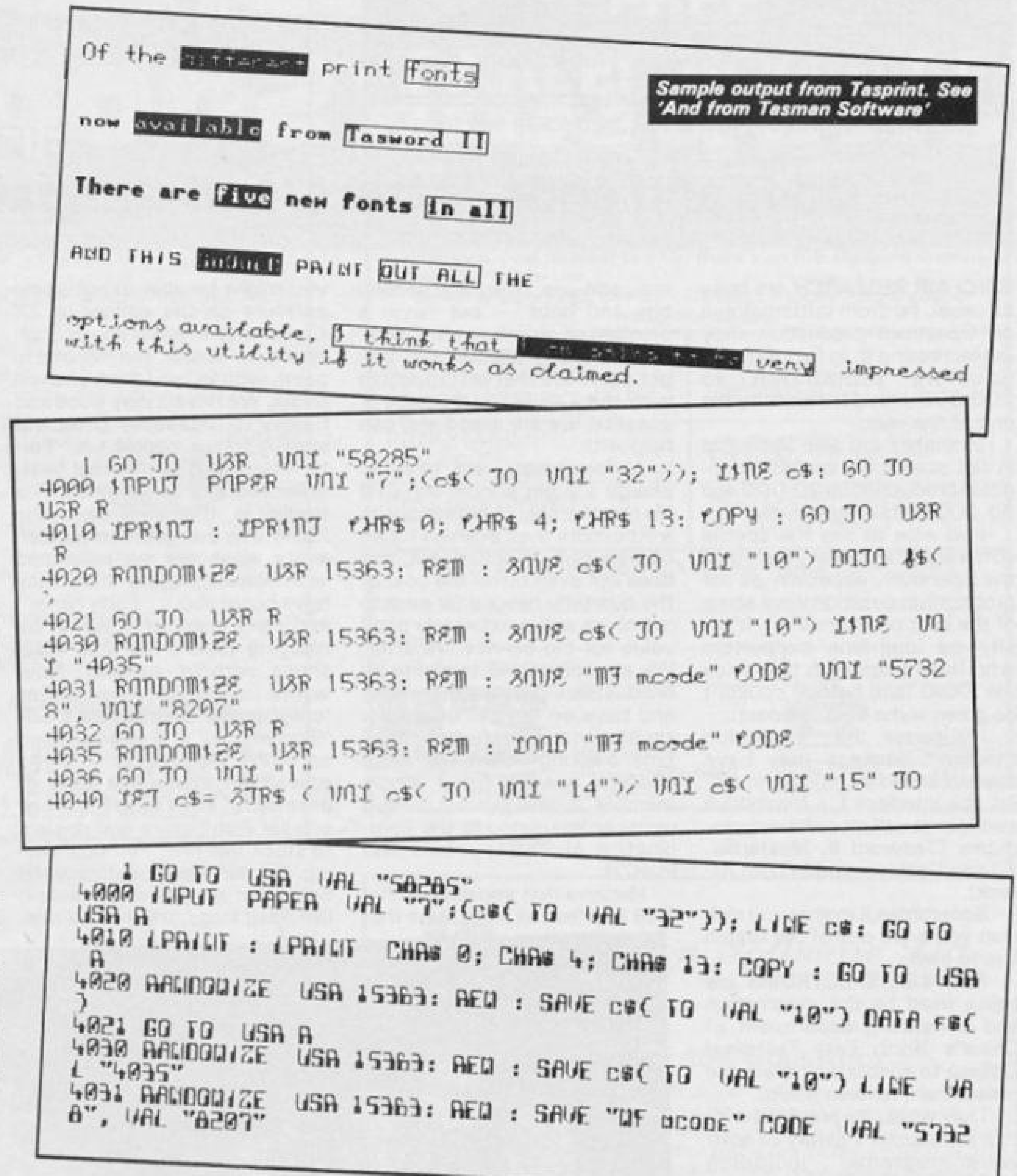
It's great to see this company thriving. Only a short while ago most people were predicting their collapse and it just goes to show that you can survive against all odds and its pleasantly surprising that it was the ZX81 which made it possible.

BERNARD BABANI (publishing) Ltd. are offering their 1984/1985 catalogue of computer books free to any reader who would like to write to them. Their address is The Grampians, Shepherds Bush Rd. London W6 7NF

THE MAKERS OF the Trichord, the sound unit we reviewed favourably some while ago have asked us to mention that they have changed distributors to Newtech (micro) Developments, at 1 Courtlands Rd., Newton Abbot, Devon TQ12 2JA. Tel 0626 62836. In that article we omitted to mention the price of said items so we'll remedy that now:

ZX81	
without amplifier	£24.95
with amplifier	£26.95
Spectrum	
without amp.	£28.95
with amp.	£28.95 + £1.00 for a beep amp socket to be fitted.

As a special Christmas present to all our readers they are offering £2.00 off any unit until Jan 30th 1985. Find the coupon printed somewhere in these pages and send it with your order for your discount.



Sample output from Tasprint. See 'And from Tasman Software'

And from Tasman Software...

Dear Sir,

Regarding the editorial comments on the Timex/Sinclair 2068 in the August/September issue of *ZX Computing* some of your readers will be interested to learn that all the products in the enclosed catalogue (Tasword Two, Taswide, Tasprint, Tasmath1, and both the parallel and RS232 Interfaces) have been converted for the TS 2068 and are available from the exclusive North American distributor of our products:

Ramax International
48945 Van Dyke
Utica
Michigan 48087
USA

Yours faithfully,
Robin Thomson

It's nice to know that the companies actually read our comments, and Tasman also sent a copy of their latest Centronics interface software after I said in a review that although I could get screen dumps for the usual range of printers, the Shinwa CP80 I was using couldn't do one.

The latest version had a specially highlighted and featured a routine specially for the Shinwa.

It works beautifully and is as well documented and user friendly as all their previous products.

I was also sent a copy of Tasprint, this program allows you to print in a choice of five extra type fonts, plus inverse of any font or boxing a section of text.

You can use it on its own with most of the interfaces or merge it with Tasword II (very easy).

The quality of print out is exceptionally good, the characters being twice as big as the normal character set, imagine a listing in script form, there's something rather unsettling about it!

Very useful in a school, it would replace those old big print typewriters which once were so popular, giving younger children access to individualised text at a professional quality print. Highly recommended for those who want to use their printers for more than simply listing programs.

The price is £9.90 and look for the sample of print somewhere in this section (using the Shinwa I add!).

ZX Computing Trichord offer.

Cut-out this coupon and use it to obtain your £2 discount off the purchase price of a Trichord.

Diary dates

The Your Computer Christmas Fair, the second annual exhibition for the home computer market, will take place at Olympia 2, London from November 30 – December 2, 1984.

Teletext adaptor for the ZX Spectrum

The TTX 2000 teletext adaptor for use with either the 16K or 48K Sinclair Spectrum is now available. No modification to the Spectrum is necessary — simply plug in, switch on and enjoy instant access to Ceefax, Ceefax 2, Oracle and 4-Tel, provided by BBC1, BBC2, ITV and Channel 4 respectively.

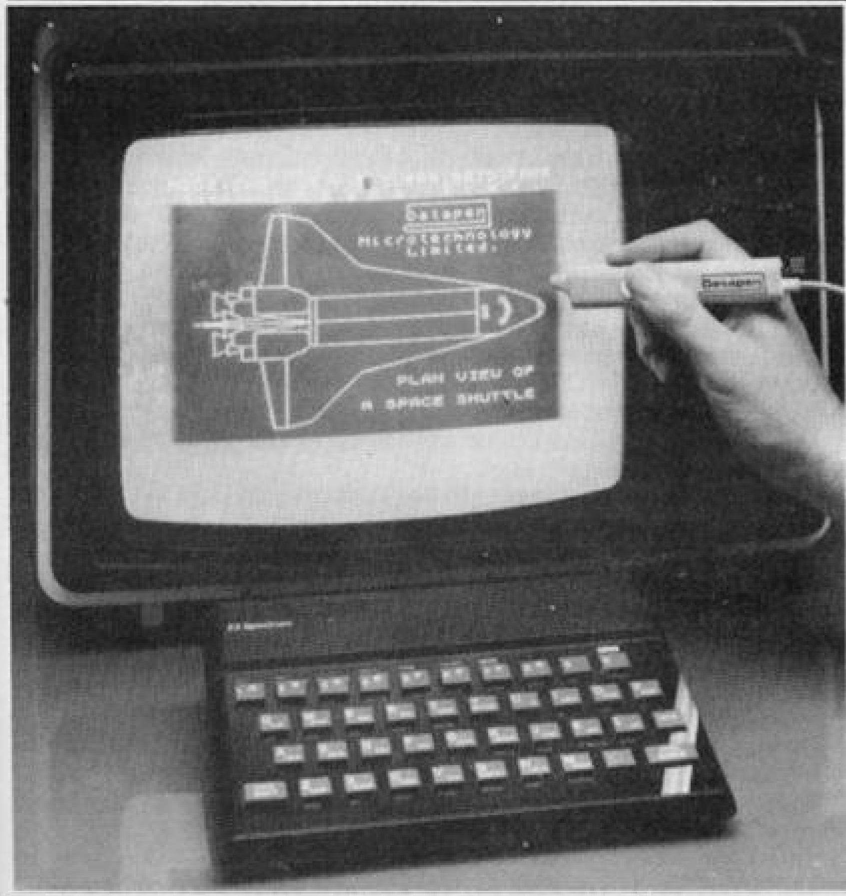
Priced at around £145 (inc. VAT, P&P) the TTX 2000, power adaptor, ZX interface cable and full detailed instructions are available in one package direct from the makers, O.E. Limited, the communications specialists of North Point, Gilwilly Industrial Estate, Penrith, Cumbria, CA11 9BN. Tel: (0768) 66748. O.E. Ltd. are also the designers and manufacturers of the Prism VTX 5000 modem.

The TTX 2000 sits directly beneath the Spectrum with ribbon connector to the micro and an auxiliary power supply lead to plug the adaptor into the mains socket. It will work with any standard black and white, or colour TV, displaying 40 columns of graphics etc. × 24 rows, ie. full teletext page reproduction.

There are four channel preset controls and pages are called up by simply keying the appropriate number. The usual options such as Hold and Reveal are provided for. Teletext pages can be held on screen, stored on a microdrive for later recall, or printed out for a permanent record using a Spectrum printer or any compatible unit. The TTX 2000 measures only 9″ × 6″ × 1.5″ and weighs just 1.25 lbs.

O.E. Ltd. have announced plans for a telesoftware programs to allow all TTX 2000 owners to receive and download specially broadcast software for use with the ZX Spectrum. The BBC has just started software broadcasting trials for the Spectrum via teletext on Ceefax, and O.E. Ltd. states that the downloader facility will be available shortly as an upgrade ROM.





ZX Spectrum lightpen from Datapen

The photograph shows Datapen's lightpen in use with SKETCH, a high resolution colour drawing program. Using this program the lightpen is capable of drawing (and erasing) lines triangles, rectangles, circles, etc., plus user-defined shapes, text characters and block area fills, all to an amazing and repeatable single pixel accuracy. The program is very easy to use as it is controlled by the lightpen placed against keywords on the screen. You don't need a keyboard if you have a lightpen!

In another lightpen operated program Datapen provide a user-defined character generator enabling an extremely easy and visual way of designing your own graphic shapes for use in other programs.

Both programs, plus an introduction program, are included along with the Spectrum version lightpen for just £29 inclusive.

The lightpen plugs into the expansion socket on the Spectrum and is powered by the computer. The Electronics are located inside the pen body itself using electronic watch style micro-miniature circuits.

Datapen lightpens, which are also available for other popular micro's, are high performance lightpens with top-of-the-range features, such as a built in switch, LED signal lamp and the ability to work under all lighting conditions.

Further details are available from Datapen Microtechnology Limited, Kingsclere Road, Overton, Hants. RG25 3JB. Telephone: 0256 770488.

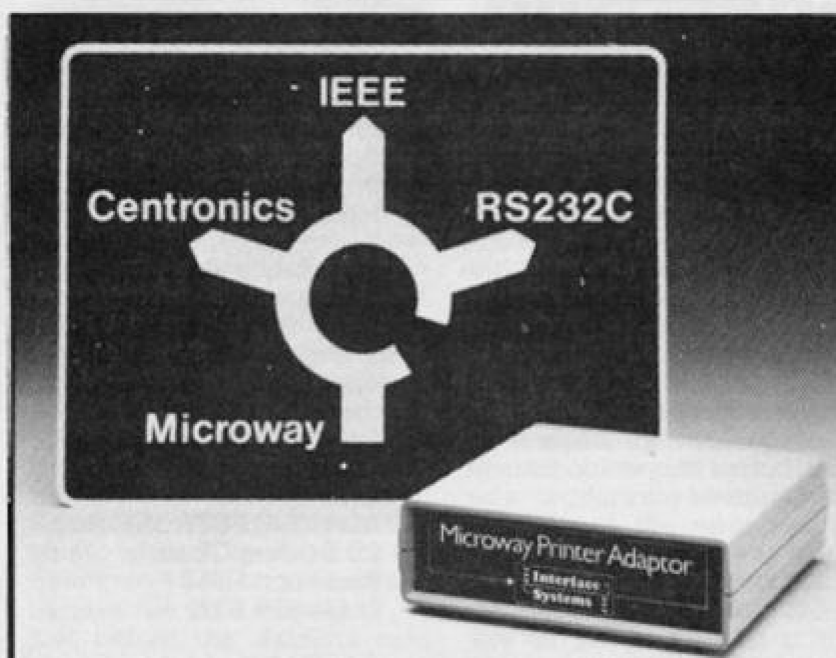
Interface Systems launch new range of printer interface adaptors

Sussex based computer interfacing specialists, Interface Systems has launched a low cost range of printer interface adaptors.

Branded Microway, the new adaptors are available in the following formats: RS232C to Centronics, Centronics to RS232C, IEEE to Centronics, IEEE to RS232C and Centronics to IEEE. As a complete range, therefore, it caters for almost any combination of RS232C, Centronics and IEEE interfaces.

This overcomes the printer compatibility problems that are frequently encountered by microcomputer users.

The Microway adaptor sits between the computer and the printer, and comes complete with all necessary cabling. Measuring 5 × 5.25 × 1.5 inches, Microway's end user price is just £78 + VAT.



A new range of hand controls

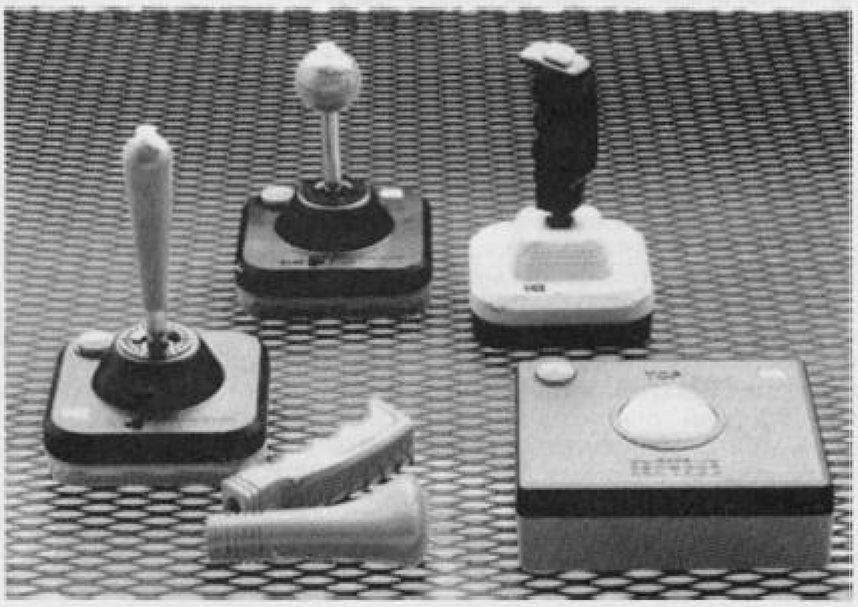
Essex-based electronic leisure company CGL, are handling distribution for Wico hand controls in the U.K.

CGL initially has four types of game control available in the Wico range: Trackball, Three Way, The Boss and Red Ball.

The **3-way Joystick** offers three ergonomically-designed interchangeable grips, a textured finish bat handle and two smooth-finish grip handles. The 3-way Joystick retails at around £25. Now you can change handles as often as you change video games... and, there are two independent fire buttons controlled by a 2-position selector switch.

According to CGL, **The Boss Joystick** is the only popularly priced precision-engineered control on the market today — it retails at around £13. Constructed of durable, high impact plastic, The Boss has split-second action-time and features a comfortable grip handle with a thumb action fire button.

The famous **Red Ball Joystick** will be familiar to most people as it looks the same as those used of most arcade games. The 6 leaf assembly provides 8-way directional action, to give lightning quick response. There are two fire buttons, one on the handle and the other on the base which allows greater versatility. The heavy duty plastic base is equipped with rubber-grip pads for table-top as well as hand-held use. Red Ball is priced at around £23.



RGB output for Spectrum

One of the major disadvantages of owning a Spectrum has always been its lack of quality graphics due to there being only a UHF signal available to the user. This not only gives poor quality colour pictures but also invariably monopolises the family TV causing much upset.

Following the success of their video output kit ADAPT ELECTRONICS have come up with the complete answer to Spectrum owners prayers: An RGB output driver module. Its main features are:

Gives true TTL level RGB on standard DIN socket.
Separate composite syncs.
Can be used on any monitor with TTL RGB inputs.
Involves no modification or internal connections to the Spectrum.
Simply plugs into expansion port.
No separate power supply required.
Does not affect UHF output.
Can be trimmed to give optimum performance for your Spectrum.
Improved picture quality reduces eye strain.

Why buy a monitor useable only on Spectrum? Now you can use any RGB(TTL) monitor of your choice. When you change computers there will be no need to change monitors.

Price: £29.95 plus 50p P&P and available from:

ADAPT ELECTRONICS
20 Starling Close,
Buckhurst Hill,
Essex IG9 5TN

or send SAE for further details.

IN......................BRIEF (hardware)

● Sinclair Research's revolutionary flat-screen pocket TV is now available in a 9ct solid gold casing. This, "for the person who has everything" gift retails for around the £2,000 mark and is currently available from Asprey & Company PLC of London.

For details regarding the solid gold cased pocket TVs contract Christopher MacDonald, Asprey & Company PLC, 165 New Bond Street, London WIY 0AR (Tel: 01-493 6767).

Customers queries regarding the pocket TV (black plastic case) should be directed to Sinclair Research Ltd., Camberley (0276) 62111.

● A new thermal printer costing less than £100 by Phi Mag Systems Limited, the Falmouth-based specialist peripheral manufacturer who recently announced the PHLOOPY data storage system.

Called the PhiPrint, the compact 40-column printer has a nine-element dot head providing printing in true descenders, lower case characters and underlining. Other features include versatile character modes and bit image graphics — facilities normally only found on larger printers.

The printer needs a Centronics interface which will cost you a further £40+.

Phi Mag Systems Limited, Tregoniggie Industrial Estate, Falmouth, Cornwall TR11 3TD.

● The Cirkit Modem, being marked in High Street retail outlets by Protek Computing Ltd, enables computers to communicate via a telephone line, and is the first of its kind to get British Telecom approval. It is compatible with most personal computers including the Sinclair ZX Spectrum, Commodore 64k, BBC Model B and Acorn Electron, when used in conjunction with a Protek Interface Pack.

● Uvipac have announced a stand alone EPROM Eraser which completely erases all EPROM's in minutes. Prices at £19.95 the company believes it is the lowest price available.

The UVIPAC EPROM Eraser comes complete with power cable and instructions.

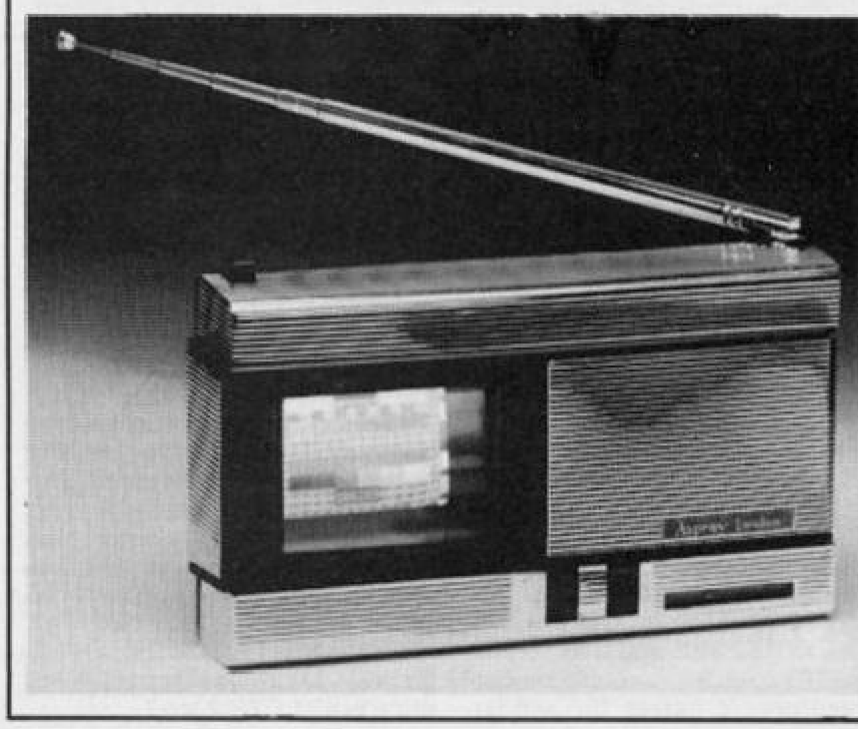
The company soon expects to be producing an EPROM Programmer at only £29.95.

● Several companies at once seem to have woken up to the fact that the Spectrum is being taken seriously by many people, and have produced professional quality storage devices.

Rotronics have an impressive unit called the wafadrive which consists of twin high speed tape drives a centronics parallel port and a RS232 serial port.

We have one which our reviewer is giving an extensive trial, but first impressions are very favourable.

Similar units, if bought separately, would cost around £200 their price is £125 including VAT and a wordprocessor program.





French and German is fun

CDS Micro Systems have produced an audio cassette which is synchronised to run with both their French is Fun and German is Fun educational programs for the Spectrum 48K. The cassette aids correct pronunciation of the programs' words and phrases and was produced using the facilities of the Open University. It retails at £3.50 and is also available in a three part presentation pack containing the audio cassette and both the French and German is Fun programs, which is priced at £12.99. This offers a saving of £2.41 compared with purchasing the two programs and audio cassette separately.

French is Fun and German is Fun are similarly structured and feature a 9 point menu providing a choice of one of six pictorial scenes and a Counting, Telling the Time and an All Picture selection. The cassette contains corresponding sections, each interspersed with a tone to allow synchronisation of tape and program.

A table is provided to record tape counter start and stop positions, making it subsequently quite easy to find the required section of tape.

IN . . . . BRIEF

● CRL, formerly Computer Rentals Limited, are going strong on the game of the TV show programs.

Terrahawks was written by Richard Taylor, and is a 3D perspective flight/search game. price is £6.95.

Coming soon (in the best TV preview vocabulary) is Magic Roundabout.

● While on the theme of TV shows, Bug-Byte, a long established and well respected software house, have obtained the rights to Automan. Watch this space. . .

● A package of tapes from Finsbury Software arrived at the office with little info.

Nice to see six ZX81 programs included, Games 1 & 2, Slot Machine, Box File, Andromeda and Princess are the first four at £4.95 and the last two at £5.95.

Their Spectrum programs are Games 1 and Astrocode at £5.95 and Andromeda and Princess at £6.95.

I'll get our tame experts to study them in depth.

● Positive Image tentatively let Bewarehouse escape a few months ago and it was greeted with moderate acclaim. They've now re-packaged it by Frog Face, an adventure game, and Ghost Rider, an arcade game which also requires some thought.

All are available for the 48K Spectrum at £5.95 each from 129 Dumbarton Rd. Glasgow.

● Words and Pictures is the latest educational program from experts Chalksoft, nicely packaged early learning games (3 to 7) complete with booklet. £9.95 from 37 Willowslea Rd. Worcester WR3 7QP.

● Cloud 9, the company who specialise in chemistry revision and simulation programs, are increasing their range by three — Write equations, Mole and Periodic Table.

All their programs will now sell at £5.50 instead of £8.50 and many are available via Micronet 800.

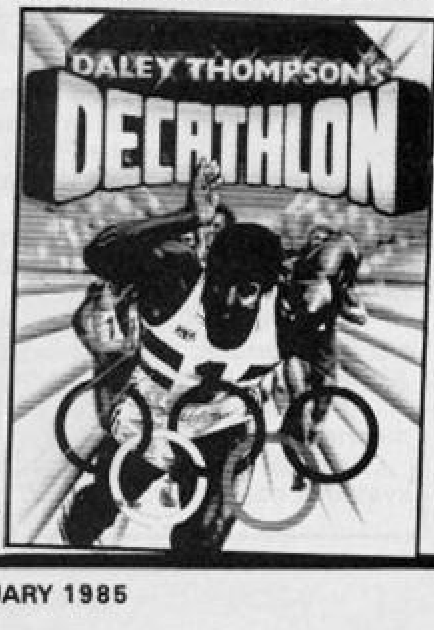
Two ways to ocean's gold

Ocean Software's new sports simulation "Daley Thompson's Decathlon" gives home micro owners the chance to compete in the Olympics from the comfort of an armchair at home!

The game which is available for the 48K Spectrum (RSP £6.90) recreates the 10 decathalon events — all of which are played under Olympic qualifying standards. Royalties from the game will go to the British Amateur Athletic Board, and a free poster offer is included with every copy of the game.



Explained Ocean managing director David Ward, "We showed an incomplete version of the game to Daley Thompson — he tried the 100 metre sprint and long jump. Once he pronounced the game "fit" our programming team had a marathon programming session to get the game ready in time."



To play the game one player takes on the role of Daley Thompson competing against the computer. To qualify each player has to take an "energy test" — and the computer's decision on fitness is final. Micro's equipped with a speech unit will hear vocal scores, and a voice intoning "On your marks, get set, GO." A specially written olympic theme tune can be heard, and animated graphics reproduce the stadium and track.

Players are disqualified if they have more than three false starts at any event — Ocean recommend taking-off at 45 degrees for the long jump, javelin and shot putt. Ocean programmer David Collier assures competitors that it is possible to beat the computer.

"Gilligan's Gold" is hidden in the perilous depths of a multi-tunnel mineshaft. The object of Ocean's arcade-style adventure game, which is available for the Spectrum 48K, is to collect and remove the bags of gold. . . . - just before the deadline runs out.

Equipped with a wheelbarrow, the player can generate extra time and raise the score, on each occasion that a bag is deposited in the barrow.

It's a simultaneous three screen game, and Gilligan can be manipulated from screen to screen by hitching a lift on a passing truck — or grabbing a handy pick axe and slamming it through a shaft wall.

However, life is not all easy for the diligent Gilligan. A horde of desperate outlaws (or possibly inlaws) are after him, and his gold. Clearly represented on the screen as out and "baddies" with kerchiefs covering their faces — they are ready to put up a terrific fight.

Quick reflexes from the player enable Gilligan to zap out an outlaw by deftly dropping a bag of gold on his head. Gilligan can also escape on a truck — but if he steps in front of it he can also be obliterated by it. He can use ladders or lifts — but because of the mining safety rules, he can only grab a ride when the lift actually stops. If not, he may come to a messy end at the bottom of a mine shaft.

Fast movers

UNIQUE, the latest software house to enter the computer games market, has just signed an exclusive contract worth several thousands of pounds.

The contract, according to UNIQUE's founder John Willan, "enables us to fully utilise the benefits of a large development system and a team of comprehensive programmers and systems analysts.

"By combining our games designing team with this new development system we are able to produce a program that is of extremely high detailed quality as well as being fun and enjoyable to play.

The first two releases were JUMP and RED ATTACK.

JUMP is an original quick response game to end all quick response games. You have to negotiate a large building using nothing but the window ledges and brickwork but watch out and get ready to JUMP. Flower pots are being thrown by mad apes and somebody keeps shutting the windows.



RED ATTACK is the most comprehensive, detailed and fast moving shoot-them-up type game ever designed. One to nine players, yes nine players!! Watch out for reviews!

These were followed by VERTIGO and WRECKAGE. All four have a strange resemblance to the programs sent by VENTAMATIC from Spain!

Fresh start from virgin games

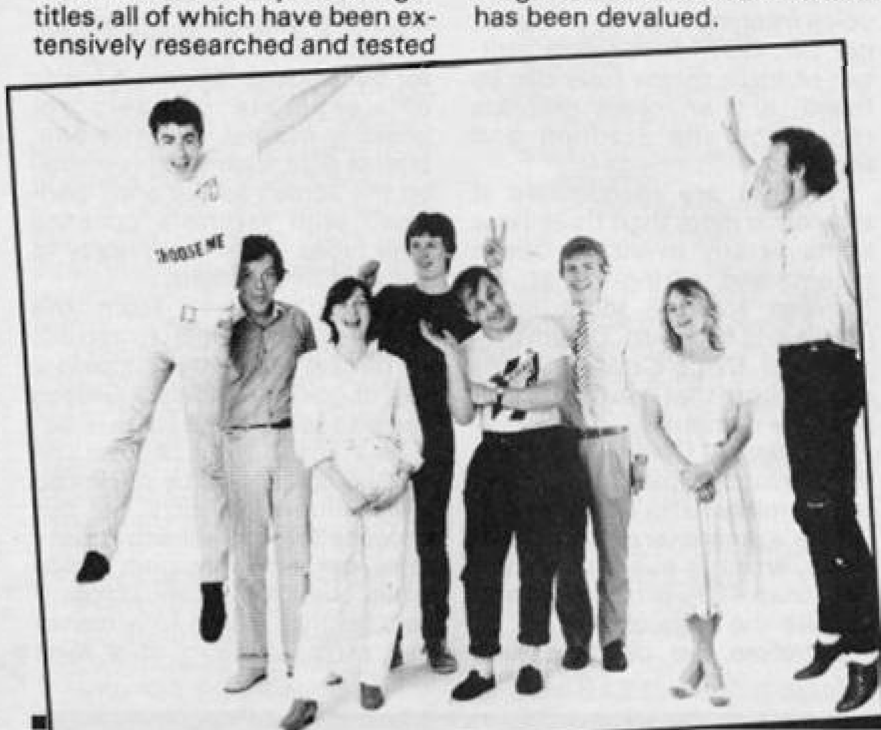
VIRGIN GAMES, the computer software company of the Virgin Group is going into the 1984 Xmas season with a fresh start.

Gone are the days of releasing huge numbers of titles for all machines in the hope that some will be hits. Instead, a much more selective approach has been adopted.

"We have changed with the market" said VIRGIN GAMES Managing Director, Nick Alexander. "The shot-gun approach will not work any more — this autumn we are only releasing 6 titles, all of which have been extensively researched and tested for market appeal and we are going to market the hell out of them!"

VIRGIN GAMES is backing its autumn titles with a £250,000 spend. The titles include an exciting new game for the Spectrum, Strangeloop. The game is priced at £5.95 despite its complexity — offering exceptional value. Virgin are also offering a prize of a £2,000 robot for the first person to successfully complete it.

"We believe that Strangeloop take the Spectrum to its limit" says Steve Webb, Virgin's Technical Manager. "We would have called it a Mega Game but we felt the term has been devalued.



IN .... BRIEF

● Hyperaction is a maze game with some originality and humour from Silversoft, another mature company. The Hampton Nightmare sounds horrific!

● Alcatraz Harry is the latest in the Mastertronic £1.99 48K Spectrum games range. Your task is to escape from a prison and it is claimed to be a mixture of arcade, strategy and adventure game. I hope it's good as I support any attempt to provide value for money, however they haven't sent any for review so I cannot make any comment.

● Kokotoni Wilf from the ubiquitous Elite looks as if it's going to be worth checking out at your local store. £5.95 for the 48K Spectrum.

● Kemp's Stock Control program has now been modified so that it will work on microdrives and make use of a full sized printer via RS232 or Centronics interface.

I still found it confusing, but must admit to not being an expert in the bookeeping line.

Also it wouldn't transfer to the disk drive even though I made all the necessary modifications. It costs £19.95.

● All serious games programmers or would be commerical program writers should look at White Lightning from Oasis Software.

Described as a games writing language, and I will agree with that, it consists of a suite of programs, a sprite editor, sprite designer and the master program.

All three are very powerful and the demo will convince you that this program, along with your imagination, can create commerical quality programs.

The master program is essentially the Forth language so if you've some experience of it then you've a head start. I've dabbled with it but this is the first time I've actually seen a practical use for it on a home computer.

As always with this kind of program, its only as good as the user, and you have to be prepared to spend a great deal of time learning to use what is essentially a powerful and sophisticated tool.

Programs written with this package run completely independantly and Oasis make no claim for royalties or place marketing restrictions on the programmer.

● One of the best accounting systems around is that supplied by Hestacrest Business Software. They have now redesigned their programs around a twin microdrive system.

This seems a very sensible idea and the set comprises of three programs which operate independantly or as part of an integrated system. They are Sales Ledger, Purchase Ledger and Cash Book.

Each program costs £32.50 or £52.50 for two or £75.00 for three. if you are contemplating running your business accounts from the Spectrum I suggest you give them a ring.

Hestacrest Ltd. PO Box 19, Leighton Buzzard, Beds. LU7 0DG Tel 052 523 7785.

● Highlight Software, 3 Nether Court, Halstead, Essex CO9 2HE are selling Contract Bridge which they claim is the 'definative game' and 'far and away the most versatile and comprehensive' computer Bridge game. I must get someone who plays to comment on it. Meanwhile you can try it for £9.95.

● Flowchart Ltd. are marketing Simple Business Accounts for £11.95 Tightly written in Basic and with microdrive options I found that the booklet had been (deliberately ?) over simplified. A little experimenting and I was starting to think it definately held possibilities.

I changed it to operate on the Technology Research Disk Drive system without any problems and was starting to find some impressive features.

I also changed it to operate with the Shinwa printer and Centronics interface; there are built in options for the ZX printer (or Alphacom 32) or RS232 driven printers.

At this stage I sent it for a full review so we can see what someone else thinks.

Personal opinion? With a Microdrive or other fast access system it could be very useful.

The Sunshine three

Well known publishers Sunshine have produced three more books on a variety of topics.

"Home Applications on your Micro" by Mike Grace, a regular contributor to several computer mags and author of the Commodore 64 adventures, is intended to provide you with practical ideas for using your micro.

It gives examples of how a database, spreadsheet and wordprocessor can help you in running your home, extending your hobbies and removing pen paper and book.

A good book for those looking for the answer to the question "Very nice, but what can it DO?" at a cost of £6.95.

"Inside your Spectrum" by Jeff Naylor, author of several commercial computer games, and Diane Rogers, well known in TV and Theatre management, is a guide to what is going on inside the case of the Spectrum.

The book is in two sections: the first deals with computer design and the second concentrates on the Spectrum, in particular the screen display, keyboard and sound.

I had a quick look at this one and at first sight it appears to be a clearly written, fascinating book, especially if you're interested in graphic work.

This one also costs £6.95.

All of these should be available from computer bookshops or from Sunshine, 12/13 Little Newport Street, London WC2R 3LD.

Programs are included to illustrate many of the points, and it is claimed that you are also introduced to the world of machine code programming gently via a monitor program and 'hands on' experiments.

A daunting task indeed and all for £6.95, I'll try and get our reviewer to give it his considered opinion in the next issue.

"Machine Code Sprites and Graphics for the ZX Spectrum" is the mouthful of a title for John Durst's book. He is a former film director who wanted to explore animation using a Spectrum.

Every chapter contains short Basic or machine code programs to perform specific tasks which may then be utilised in your own programs.



IN . . . . BRIEF

- The Micro Manual by Stewart Hasted is promoted as "the book the manufacturers should have written in the first place" and is intended to be clear, simple and enjoyable.

The press release which included a few reproduced pages looked interesting, but no sign of a price could be found. Contact SHA Publications, 65 Sheldon St., Covent Garden, London WC2.

- Hutchinson Computer Publishing Company Ltd. have released five books for the QL which cover an introduction, Superbasic, desk top computing, wordprocessing and advanced programming.

The QL series has been produced with the co-operation and support of both Sinclair Research and Psion and the series editor is the well known and respected Robin Bradbeer. Each book is priced at £6.95.

- Toby Matthews and Paul Smith are the two 16 year old authors of "Winning Games on the ZX Spectrum" published by Ellis Horwood Ltd.

The slightly ambiguous title refers in fact to the twenty "demanding new games" which are featured in this tome, all with "exciting new titles" like Code Breaker, Skiing and Horse Race. Its 162 pages will cost you £5.95.

- The latest edition of Microcomputer Software Directory contains over 5,000 software packages from more than 1,300 suppliers, making it the most comprehensive directory of microcomputer software available in the UK. Packages are available on more than 600 machines, operating under the control of 240 different operating systems.

There are four indexes in the Microcomputer Software Directory: machine, operating system, product, and occupation/application. The index by machine lists packages by application, then alphabetically according to the type of machine on which they run.

The Microcomputer Software Directory is published by Computing Publications Ltd, and can be obtained from 53-55 Frith Street, London W1A 1HG. Telephone 01-439 4242. Price £40 plus £2.20 p&p.

Two new from Melbourne House

Two of the latest books from Melbourne House are aimed at the advanced user.

"Advanced Spectrum Machine Language" is written by David Webb and is aimed at programmers who already have some knowledge of machine code programming.

The book contains many machine code routines which can be included in the reader's own programs. The programs range from changing the colour of the screen and border, horizon movement etc. to animation and pixel fine movement.

At £6.95 this seems a useful book for those who've cracked the basics of machine code and want to go a step further.

"Advanced Spectrum Forth" is a book which I found useful, I've dabbled with Forth but never really created a complete program in this language.

This book talks in practical techniques and is full of useful suggestions. Although fairly general in application it is specifically aimed at users of the Abersoft Forth program, also marketed by Melbourne House.

Worth looking at if you intend to use Forth rather than simply experiment with it. The price is £8.95 which may deter many. Both are available in bookshops or direct from Melbourne House, 39 Milton Trading Est. Abingdon, Oxon. OX14 4TD.

Mindplay

Greg Turnbull looks at games of strategy and tactics

ISLETS OF LANGERHANS, Amazing Games, £5.50. 48K Spectrum

This is one of the many recently released programs written using Gilsoft's "The Quill". The adventure makes a most welcome change from battling through the usual coves or rooms, killing endless goblins, animals, etc. Your quest is to journey through the human body to locate the 'Islets of Langehans' (look it up in a medical dictionary!), and return with them to the outside world.

Due to the use of the Quill, the program is in 100% machine code, hence quick to respond and accepts the usual commands. There are mainly verb-object combinations, which can be shortened to four letter strings. For example: THROW KNIFE (Not a clue).

No comprehensive document comes with the tape — unlike other Amazing Games — so part of the game is to discover a vocabulary that works.

This lack of knowledge, plus the biological nature of the text, may cause a few problems for people without 'O' level Biology. However, the problems are not to difficult, and the format does make a pleasant change.

I believe a version of this program is available for the ZX81, entitled, "Fantastic Voyage". The idea for the program comes from the excellent Isaac Asimov novel "Fanastic Voyage", which was made into a superb film with Raquel Welch in 1966. If you have either read the book or seen the film you will have a head-start here.

Amazing Games also claim that the program can be used as a revision aid for students taking 'O' level Biology exams. As an ex-Biochemist I would say that this is partially true. A knowledge of physiology/biochemistry is certainly an advantage. If you get stuck you can always look the terms up.

The text is not entirely clinical; there are references to books (E.T.), telephones, record players, emeralds, etc. So previous adventurers shouldn't have too many problems. A couple of humorous touches can be seen, e.g. If you ask for HELP all you get it: "This isn't a Scott Adams adventure!"

On your journey you will visit such locations as: the liver, kidneys, brain, heart (take care here, as once you pass there is no return) and many others. Problems can be conquered (and so increase you % score) include: gangs of starch molecules, bacteria and proteins, etc.

The only criticism I have of the game is that objects may be used more than once, so you could try them all until you get the right one, requiring no specialised knowledge. Otherwise I enjoyed playing this most interesting and unusual adventure. It is a pity that no graphics could be included.

Hopefully wide-spread use of the Quill will allow writers to come up with many more such games, and other unexpected formats. This will prevent the adventure field from becoming stale. I look forward to playing further Amazing Games programs: "Thriller" and "The Last Jedi"; watch this column for future reviews.

THE CODE Soft Concern Ltd. 48K Spectrum

This is a highly complex text-only adventure puzzle, with a prize of £25,000 for anyone who can complete it. Ten runner-up prizes of £25 are also available. The idea being that you are a secret agent in a Russian military establishment. You must work your way through four floor levels to reach the code room, and crack the code.

The program is highly detailed in text-only adventure, with extremely complex problems to be solved. This is to be expected considering the sum of money involved if you can beat it.

Verdict: Only buy it if you are superb at solving difficult puzzles and can think laterally, or are very short of cash! If like me you can't progress very far through the program, at least there is a nice Bogart screen picture to look at while the tape is loading.

STAR TRADER Bug-Byte 48K Spectrum

Star Trader is one of the growing range of arcade/adventure programs for the Spectrum. In this case the game has more of an arcade-strategy feel to it. Basically it involves you in buying various types of goods on one planet, transporting them safely to another planet, and trying to sell them again at a profit.

The strategy aspect comes in knowing where to buy the goods and how many items to purchase (your storage soace being limited). The arcade aspect comes between the buying and selling; you've got to get there safely first! This is made more difficult by the fact that you are more than likely to be attacked by space pirates 'en route'.

If you have the correct weapons you can fight back in an approximate simulation of 3-D, which can be fun. The graphics on the planets consist mainly of the faces of shopkeepers, and are well done.

Other problems that can beset you on your travels are pick-pockets, muggers and other such unpleasant people. If you thought this was enough, you still have to consider your stomach. You must eat and drink (mostly beer in the local Stellar pub), to keep you in good health. If you fail to do this you won't be allowed to take-off and will eventually die of starvation

You start off with a set amount of cash which is reduced by buying goods, food/drink, payments to space pirates if you get caught etc. Yet another problem to face is space tax. When landing on a new planet you can choose to declare all, some or none of you cargo and risk losing it all. Alternatively you can try to bribe a customs official (which may not always work).

Carefull planning (by use of the report facilites) in buying and selling is required. Overall a game that will give you plenty to think about. However, it can get a bit repetitive because of the menu-driven format. The graphics make a welcome addition here. Recommended for arcade or strategy fans looking for something a little different.

THE INFERNO Richard Shepherd Software £6.50. 48K Spectrum

This is the latest graphic program from the well-known Shepherd stable. It has extremely fast, colourful and quite pretty graphics which can be switched off. The game is based on Dante's 13tyh century book "Inferno".

Your quest is to explore the underworld, travelling through the nine circles of Hell, to reach the centre and finally escape.

Some of the areas to be explored include: The city of Dis, the marsh of Styx, plains of ice and many others. Your actions can influence the behaviour of other characters, but I found that I didn't use this interaction feature much. You must try not to be too violent as most other characters are stronger than you are.

The SAVE routine is incredibly fast and can be used often, without boredom. There is no (%)SCORE routine as such, although occasional humour can be found: EXA(mine) your shield and you get, "You can see something horrible, no, it's just your reflection!"

Seasoned adventurers should have little problem with this program. However, the boat can be tricky to use in crossing the Styx. In conclusion, an impressive looking game, but somewhat lacking in text substance to make it totally enthralling. It can be recommended with some reservasions.

No, not a simulation of the ZX81 RAM problem, but a great motoring game from Luc De Jaeger of Gent, Belgium.

This is a clever combination of a driving simulation, an adventure game and also needs the quick reactions associated with arcade games!

Once you have typed in this listing and RUN the program, the first thing you'll see is your dashboard. At the top of the screen is a line representing your speedometer, this is calibrated in KM/H.

Below this on the left is a rectangle which will indicate brake failure, and on the right is a rectangle which shows when you are very low on fuel.

A digital petrol tank meter is set below this and has 60 litres at the start of the journey, as you drive you will use up petrol and when the gauge starts to act strangely then you're starting to get low.

On the left of the screen is a display of the options:

B to brake
5 to turn left
8 to turn right
F to accelerate
S to decelerate

A single press of any of these keys should be enough to change your status accordingly.

On the right of the screen is the computer display of the present situation on the road and, being ultra user friendly, it also informs you of the correct action to take. It is now down to you to react correctly within a reasonable time, failure to do so will inevitably result in the crash of the title.

So now all you have to do is take the driving seat, fasten your safety belt, and off you go (remembering to drive on the right!) until you reach home.

Technical details

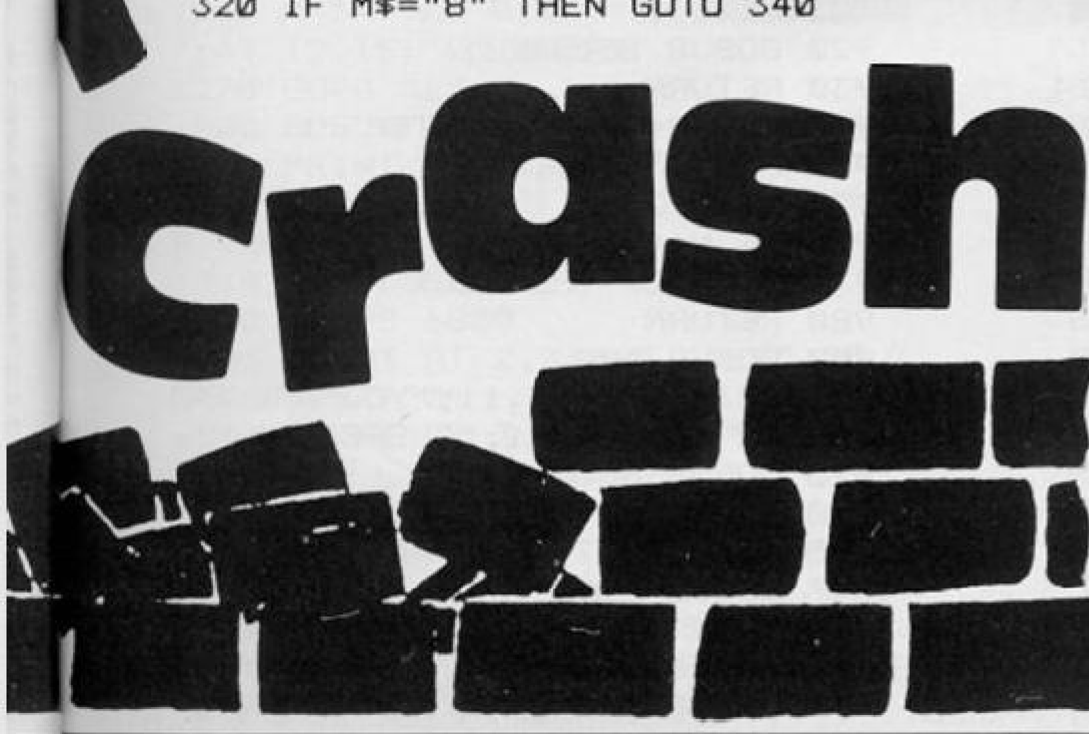
The main routine begins at line 80 and all the different sections are set in separate subroutines which are arranged as follows:

150 — 216	Long road
230 — 299	Speed
300 — 370	Turning
400 — 498	Brake failure
500 — 579	Empty petrol tank
580 — 615	Accident
650 — 699	Low petrol
710 — 980	Crossing
1000 — 1025	Speed
1027 — 1090	Braking
1091 — 1155	Speed
1200 — 1275	Home
1500 — 1510	An accident
6500 — 6655	Dashboard
6800 — 6830	Speed/Petrol
7000 — 7055	CRASH
7500 — 7505	Turning

```
  5 CLS          :
  7 LET N=4
 10 LET A=4
 15 LET A$="FUNCTIONS"
 20 LET B$="                  "
 25 LET D$="
 "
 30 LET E$="    "
 35 LET F$="               "
 40 LET G$="=)"
 45 LET H$="(="
 50 LET I$="BRAKE"
 55 LET J$="FAILURE"
 60 LET K$="NO"
 65 LET L$="PETROL"
 75 LET Z=62
 80 GOSUB 6500
 81 RAND
 83 FOR N=0 TO 10
 85 IF RND>.3 THEN GOSUB 150
 95 IF RND>.3 THEN GOSUB 230
100 IF RND>.3 THEN GOSUB 300
105 IF RND>.3 THEN GOSUB 710
107 IF RND>.3 THEN GOSUB 400
110 IF RND>.3 THEN GOSUB 1000
111 IF RND>.3 THEN GOSUB 1027
112 NEXT N
115 GOTO 1200
150 GOSUB 400
153 PRINT AT 10,12;"YOU ARE DRI
VING ON A";AT 12,12;"LONG ROAD"
155 IF N<10 THEN GOTO 200
165 GOSUB 6800
175 GOSUB 300
180 RETURN
200 PRINT AT 14,11;"YOU MAY HIG
HER YOUR";AT 15,22;"SPEED"
205 IF INKEY$="" THEN GOTO 205
210 IF INKEY$="F" THEN LET N=N+
INT (RND*15)+1
213 IF N>27 THEN LET N=27
215 GOSUB 6800
216 GOTO 155
230 GOSUB 400
235 IF N<=15 THEN GOTO 245
240 IF N>15 THEN GOTO 278
245 PRINT AT 17,10;"YOU ARE NOT
 DRIVING";AT 18,18;"VERY FAST"
252 FOR J=1 TO 55
255 LET M$=INKEY$
```



```
 260 IF M$="F" THEN GOTO 272
 265 NEXT J
 270 GOSUB 7000
 271 GOTO 600
 272 LET N=N+INT (RND*24)+1
 273 IF N>27 THEN LET N=27
 275 GOSUB 6800
 276 GOSUB 400
 277 RETURN
 279 GOSUB 6800
 280 PRINT AT 9,11;"YOU ARE DRIV
ING TOO";AT 10,22;"FAST";AT 11,1
1;"YOU CANNOT AVOID";AT 12,12;"A
N ACCIDENT"
 281 FOR I=0 TO 65
 282 NEXT I
 283 IF RND<.459 THEN GOTO 297
 284 GOSUB 7000
 285 CLS
 287 GOSUB 6500
 290 PRINT AT 10,11;"FORTUNATELY
 YOU ARE";AT 11,11;"NOT HURT AND
 YOU CAR";AT 12,11;"IS NOT TOO M
UCH";AT 13,20;"DAMAGED";AT 14,11
;CHR$ 5;CHR$ 5;"     DRIVE ON     
";CHR$ 133;CHR$ 133;AT 9,11;"YOU
 HAD AN ACCIDENT"
 292 FOR I=0 TO 95
 293 NEXT I
 295 RETURN
 297 GOSUB 7000
 298 PRINT AT 2,1;"++++++++++++R
 I P ++++++++++++"
 299 GOTO 565
 300 GOSUB 400
 305 PRINT AT 10,12;"THERE IS A
TURNING";AT 14,15;"TO THE RIGHT"
 310 FOR J=1 TO 45
 315 LET M$=INKEY$
 320 IF M$="8" THEN GOTO 340
 325 NEXT J
 330 GOSUB 7000
 335 GOTO 7500
 340 FOR S=0 TO 10
 345 PRINT AT 1,29;G$;AT 1,29;E$
 350 NEXT S
 360 GOSUB 6800
 365 PRINT AT 12,12;"ALL IS WELL
NOW"
 366 GOSUB 710
 370 RETURN
 400 FOR L=9 TO 21
 405 PRINT AT L,10;D$
 410 NEXT L
 415 RETURN
 430 GOSUB 400
 432 LET C=RND
 440 GOSUB 6800
 445 FOR I=0 TO 10
 447 PRINT AT 5,4;I$;AT 6,3;J$
 449 PRINT AT 5,3;F$;AT 6,3;F$
 451 NEXT I
 453 PRINT AT 18,11;")))DO SOME
THING((("
 454 IF INKEY$="" THEN GOTO 454
 456 IF INKEY$="B" THEN GOTO 435
 458 IF INKEY$="5" THEN GOTO 466
 460 IF INKEY$="8" THEN GOTO 480
 462 IF INKEY$="S" THEN GOTO 487
 464 IF INKEY$="F" THEN GOTO 498
 466 FOR J=0 TO 10
 468 PRINT AT 1,1;H$
 470 PRINT AT 1,1;E$
 472 NEXT J
 473 PRINT AT 11,11;"YOU ARE ON
THE BORDER";AT 12,12;"OF THE ROA
D";AT 14,13;"HERE ENDS THE GAME"
;AT 15,19;"FOR YOU"
 474 FOR I=0 TO 75
 475 NEXT I
 476 GOSUB 7000
 478 GOTO 565
 480 FOR J=0 TO 10
 481 PRINT AT 1,29;G$;AT 1,29;E$
 482 NEXT J
 484 PRINT AT 9,11;"YOU WILL HAV
E AN";AT 11,15;"ACCIDENT"
 485 GOSUB 281
 486 RETURN
 487 LET N=N-INT (RND*15)+1
 488 IF N<4 THEN LET N=6
 489 GOSUB 970
```



```
 494 GOTO 484
 495 LET N=N+INT (RND*12)+1
 496 IF N>27 THEN LET N=27
 497 GOSUB 6800
 498 GOTO 580
 500 GOSUB 400
 515 FOR J=0 TO 10
 520 PRINT AT 5,13;K$;AT 6,11;L$
 525 PRINT AT 5,11;F$;AT 6,11;F$
 530 NEXT J
 535 PRINT AT 13,11;"SLOW DOWN"
 540 IF RND<.8 THEN GOTO 560
 545 IF INKEY$="" THEN GOTO 545
 550 IF INKEY$="S" THEN GOTO 552
 551 GOTO 600
 552 LET N=N-INT (RND*12)+1
 553 GOSUB 970
 554 GOTO 650
 555 IF RND>.6 THEN GOTO 80
 560 GOSUB 7000
 561 PRINT AT 2,2;"THERE WAS NOB
ODY TO HELP YOU,";AT 4,2;"YOUR C
AR HAS NO PETROL,SO";AT 6,2;"YOU
 HAVE TO WALK"
 565 PRINT AT 21,12;"ANOTHER GAM
E ?(Y-N)"
 570 IF INKEY$="" THEN GOTO 570
 575 IF INKEY$="Y" THEN GOTO 5
 579 STOP
 580 LET N=N+INT (RND*25)+1
 582 IF N>27 THEN LET N=27
 588 GOSUB 6800
 590 GOSUB 7000
 591 PRINT AT 2,3;"YOU COULD NOT
 AVOID AN ";AT 4,3;"ACCIDENT BEC
AUSE YOU DROVE TOO FAST"
 592 GOTO 565
 600 CLS
 605 GOSUB 7000
 610 PRINT AT 4,7;"ANOTHER CAR C
RASHED";AT 6,7;"INTO YOU"
 615 GOTO 565
 650 PRINT AT 15,11;"GO TO THE L
EFT BORDER";AT 16,10;"THERE IS S
OMEONE WHO CAN";AT 17,11;"HELP Y
OU"
 655 IF INKEY$="" THEN GOTO 655
 660 IF INKEY$="5" THEN GOTO 675
 665 GOSUB 7000
 670 GOTO 600
 675 PRINT AT 19,11;"ALL IS WELL
";AT 20,11;"YOU FOUND SOME PETOL
"
 680 LET Z=55
 685 GOSUB 6800
 690 FOR I=0 TO 65
 695 NEXT I
 697 GOSUB 400
 699 RETURN
```

```
 710 GOSUB 400
 723 GOSUB 6800
 725 PRINT AT 14,10;"YOU GO STRA
IGHT TO";AT 15,14;"A CROSSING";A
T 16,12;"   DO SOMETHING   ";AT
17,11;"(YOU HAVE PRIORITY)"
 730 FOR J=1 TO 60
 735 LET M$=INKEY$
 740 IF M$="F" THEN GOTO 775
 745 IF M$="B" THEN GOTO 805
 750 IF M$="S" THEN GOTO 825
 755 IF M$="5" THEN GOTO 855
 760 IF M$="8" THEN GOTO 895
 765 NEXT J
 770 GOTO 600
 785 LET N=N+INT (RND*12)+1
 790 IF N>27 THEN LET N=26
 795 GOSUB 6800
 800 GOTO 81
 805 CLS
 807 LET N=N+INT (RND*15)+1
 808 GOSUB 970
 810 PRINT AT 7,4;"WHY DID YOU S
TOP ?";AT 8,4;"YOU HAD PRIORITY"
 820 GOSUB 7000
 822 GOTO 565
 825 GOSUB 970
 840 GOSUB 6800
 845 GOSUB 400
 850 RETURN
 855 FOR I=0 TO 10
 860 PRINT AT 1,1;H$;AT 1,1;E$
 865 NEXT I
 880 GOSUB 6800
 885 GOSUB 1027
 890 RETURN
 891 LET N=27
 892 GOSUB 6800
 895 GOSUB 1027
 900 PRINT AT 1,29;G$;AT 1,29;E$
 905 NEXT I
 920 GOSUB 6800
 930 RETURN
 970 FOR Q=27 TO 8 STEP -1
 972 PRINT AT 1,Q;" "
 974 NEXT Q
 975 IF N<4 THEN LET N=5
 977 IF N>27 THEN LET N=10
 980 RETURN
1000 GOSUB 400
1005 PRINT AT 12,11;"YOU ARE DRI
VING ON";AT 14,11;"A SPEEDWAY"
1015 GOSUB 6800
1020 IF N<15 THEN GOTO 1095
1025 IF RND<.7 THEN RETURN
1027 GOSUB 400
1030 PRINT AT 15,11;"▚▚▚ATTENTIO
N▚▚▚";AT 16,11;"THE CARS IN FRON
T OF";AT 17,11;"YOU ARE BRAKING"
```

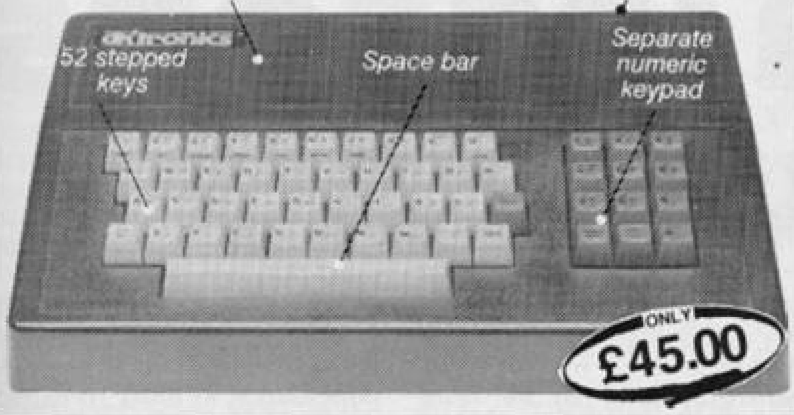
```
1035 FOR S=0 TO 25
1040 LET M$=INKEY$
1045 IF M$="B" THEN GOTO 1060
1050 NEXT S
1055 GOTO 1500
1060 LET N=N-INT (RND*15)+1
1062 IF N<4 THEN LET N=6
1065 GOSUB 970
1080 GOSUB 6800
1085 PRINT AT 18,12;"ALL RIGHT"
1090 RETURN
1091 GOSUB 6800
1092 IF N<15 THEN GOTO 1097
1093 GOTO 1110
1097 PRINT AT 16,10;"▒HIGHER YOU
R SPEED▒"
1100 IF INKEY$="" THEN GOTO 1100
1105 IF INKEY$="F" THEN GOTO 113
0
1120 GOSUB 6800
1125 GOTO 600
1140 LET N=N+INT (RND*10)+1
1145 IF N>27 THEN LET N=26
1150 GOSUB 6800
1155 RETURN
1200 CLS
1205 LET Q$="████████████████████
█"
1210 FOR I=4 TO 18
1215 PRINT AT I,5;Q$
1220 NEXT I
1225 LET Z$="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒"
1230 FOR L=4 TO 18
1235 PRINT AT 5,L;Z$
1240 FOR K=12 TO 18
1245 FOR M=7 TO 12
1250 PRINT AT K,M;" "
1255 NEXT M
1260 NEXT K
1265 PRINT AT 8,10;"WELCOME HOME
";AT 12,15;"YOU WON"
1270 GOTO 565
1500 GOSUB 7000
1505 PRINT AT 1,4;"YOU CRASHED I
NTO THE CARS";AT 2,4;"IN FRONT O
F YOU"
1510 GOTO 565
6500 GOSUB 6800
6505 PRINT AT 2,3;"15 30 45 60 7
5 90 105 120"
6510 PRINT AT 3,28;"KM/H"
6525 FOR C=0 TO 31
6530 PRINT AT 4,C;"-"
6535 NEXT C
6540 PRINT AT 10,0;A$;AT 11,0;"-
--------";AT 13,0;"(B)RAKE";AT 1
5,0;"5=LEFT";AT 16,0;"8=RIGHT";A
T 18,0;"(S)LOW";AT 19,0;"(F)AST"
6545 FOR D=0 TO 9
6550 PRINT AT 9,D;"▒";AT 21,D;"▒
"
6555 NEXT D
6560 FOR E=10 TO 21
6565 PRINT AT E,9;"▒"
6570 NEXT E
6572 FOR F=2 TO 18
6575 PRINT AT 4,F;"-";AT 7,F;"-"
6580 NEXT F
6585 FOR G=5 TO 6
6590 PRINT AT G,2;"I";AT G,10;"I
";AT G,18;"I"
6595 NEXT G
6600 PRINT AT 5,21;"PETROL)";AT
6,22;"TANK )";AT 5,31;"L";AT 5,2
8;Z
6610 FOR H=0 TO 10
6615 FOR L=0 TO 7
6620 NEXT L
6625 PRINT AT 19,16;"WARNING"
6627 PRINT AT 19,15;B$
6630 NEXT H
6640 PRINT AT 20,15;"ARE YOU REA
DY ?";AT 21,20;"(Y-N)"
6645 IF INKEY$="" THEN GOTO 6645
6650 IF INKEY$="Y" THEN RETURN
6655 GOTO 6610
6800 FOR X=A TO N
6805 PRINT AT 1,X;"▒"
6810 NEXT X
6812 LET Z=Z-2
6825 PRINT AT 5,28;Z
6827 IF Z<=0 THEN GOTO 500
6828 IF Z>60 THEN LET Z=60
6830 RETURN
7000 CLS
7005 PRINT AT 9,1;"████  ████
████ ████ █   █"
7010 LET Q$="█     █   ██   █
 █   █   █"
7015 FOR R=10 TO 13
7020 PRINT AT R,0;Q$
7025 NEXT R
7030 PRINT AT 14,0;"█     █████
 ██████ ████ █████"
7035 PRINT AT 15,0;"█     ██
 █   █   ██   █"
7040 PRINT AT 16,0;"█     █  █
 █   █   ██   █"
7045 PRINT AT 17,0;"█     █   █
 █   █   ██   █"
7050 PRINT AT 18,0;" ████ █    █
 █   █ ████ █   █"
7055 RETURN
7500 PRINT AT 1,4;"YOU DID NOT T
URN OFF";AT 4,8;"SO YOU PERISHED
"
7505 GOTO 565
```

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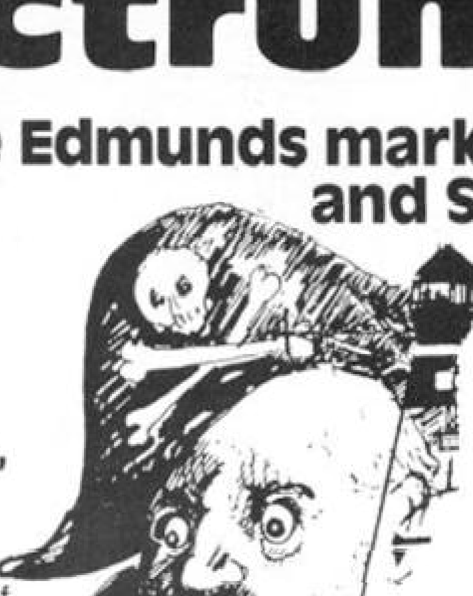
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The Spectrum Connection

Spectrum lessons

Mike Edmunds marks a mixture of ZX81 and Spectrum programs



TIME WITH THE PIRATES
ZX81 (16K) £3.00
MPT Software, 42 Readwald Drive, Bury-St-Edmunds, Suffolk

In the dim, dark recesses of many a school stockroom, I suspect that there are many little ZX81s just waiting for suitable software to come along that will justify their purchase and, once again, see their emergence to sit alongside their more grandiose counterparts.

For many schools the humble Sinclair was perhaps a first attempt to enter the computer age and, whilst proving to be ideal beginners machines, they have been quickly superceded by more sophisticated models. It has long been felt by many teachers however that this, now relatively simple machine, still has a great deal of potential for use within the classroom. It is with some pleasure therefore that I am able, this issue, to review programs that aim to see the dusting off of many ZX81s.

Firstly a program that helps the pupil to tell the time. From MPT Software, a newcomer on the education scene, comes TIME WITH THE PIRATES. Essentially this is a 'drill and practice' type program with a little 'carrot' at the end of a test-game.

It is a little difficult to see just which age range this is aimed at, but lower Juniors should be able to cope sufficiently well, although a fair reading ability is required for both the on-screen instructions and the fairly detailed instruction sheet that accompanies the program. It is suggested by the author that parental help may be required for some children.

The program has six levels, each of the first five dealing with and testing a different point. the sixth level consists of a five-question test with a graphic reward of pirates (or the child if they didn't score highly (walking the plank.

In order, the levels deal with O'CLOCK, QUARTER PAST, HALF PAST, QUARTER TO and MINUTES PAST/TO. the program loaded easily and, given the limitations of the 81's graphics, is nicely laid out. the pictures of the clocks are clear and a good attempt has been made to Cater for such things as the offset minute hand at quarter past the hour.

There are however, certain aspects of the program which are not so good. Several spelling mistakes in on-screen instructions are the first notable error and programs of this nature should br thoroughly checked before release. The program is not fully error-trapped and will accept certain inputs that should have no effect but actually do! Apart from these small points the program runs well and actually seems to achieve what it sets out to do.

In addition, because of the necessity for accurately spelt inputs, it also aids spelling, although care must be taken with spacing of answers. The comprehensive instructions therefore need to be read carefully nad it is likely hat teacher/parent help will be needed until the pupil is familiar with the programs.

The 'carrot' is a nice little graphics routine but as it is the same for every test I suspect that a child would soon lose motivation. In conclusion, this is a reasonable program for the reinforcement of skills already learnt and could conceivably be used by small groups within the classroom. I do not see it taking over from traditional methods of learning/teaching time but at the price is certainly worthy of consideration.

HIDDEN LETTERS
ZX81 (16K)
POPPY PROGRAMS, Richmond House, Ingleton, Carnforth, Lancs. LA6 3AN

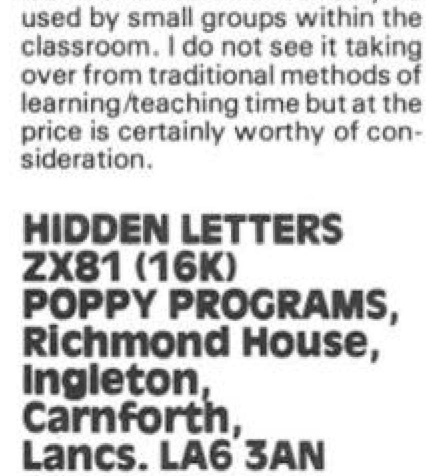
This is a program that has been avilable for quite a long time now but nevertheless is worth mentioning as a good example of programs that can be used right across the Junior age range (and beyond) and for a whole range of abilities.

The program uses a tried and tested educational technique known as 'cloze procedure' to give practice is spelling. It also develops comprehension skills and encourages the pupil to use context clues of grammar and punctuation in order to extract the sense of the text. All of these skills are an essential prerequisite for reading fluency and the program seeks to develop these sills in an enjoyable manner.

The program includes a short text and there is a choice of 9 difficulty levels. The aim of the game is to discover the hidden letters (a la Hangman), the pupil being rewarded with a number of stars for each letter discovered. The number of actual letters hidden depends upon the difficulty level selected. The given text is fairly basic although even this may prove difficult for the option to enter your own text. It is suggested that a single *sentence from a reading book* is ideal for the beginning reader, whilst a 'topic type' passage may suit the more able child.

The procedure for tailoring the program to suit individual needs is clearly explained and it is possible to build up a library of suitable texts.

In use the program performed well, was nicely laid out and easy to use, albeit rather slow. However this type of program has wide applications, especially for those with reading difficulty even though the 'reward' is not much of an incentive. I see the major problem being the time necessary to type in the alternative texts.



FASTWORD
ZX81 (16,32,48,64K) '8.50
Softchoice Ltd, 52 Platts Lane, London, NW3 7NT.

This is not really an educational package, more of a utility with possible eduational uses. I occasionally see the odd report about business users basing

their system upon the good old '81, and this, combined with the frequent advertisements for multiple expansion units indicates that a lot of people still have a great amount of faith in a machine that many now consider almost redundant!

For those with such a system this package may be just ideal, in fact even if your totla memory is never likley to exceed 16K it may still be value for money. FASTWORD is the name of the twin cassette suite of programs and it is essentially a powerful word processor.

The cassettes contain five prorams — a 16K Editor, Formatter 1 and 2, together with Word Processor 1 and 2. The tapes also contain fastload version of these programs for use in conjunction with the FASTLOAD system developed, as was FASTWORD, by Dr.G.Pearson.

Given the limited space of reviews such as these it is not really possible to do such a program justice and I intend therefore just to give an overview of the system, my comments relating mainly to the 16K elements of the package.

The system has machine-code routines which allow the saving and loading of text files to and from tape at high speed — virtually a disk system for the 81! The editor sections if the programs are fairly fast and would allow a moderate typing speed. . . provided of course that you have a decent keyboard!

Text editing is also impressive and as the extremely comprehensive manual points out, '. . . menu-driven commands support somevery fancy text editing techniques.' Printing capabilities of the program are very good and contain a character set that includes nearly everything that a normal typewriter can print, plus subscript numbers as well as several useful special symbols.

36 characters per line are produced with the ordinary print command but block of continous lines up to 255 characters long can be printed with a wide variation of character sizes possible.

If you have only 16K of RAM then all you need to use is the 16 K editor to create, load and edit text files. The maximum file size is 125 screen lines, roughly equivalent to two typed pages. You can then use Formatter-1 to load your text files from tape and print them.

The Editor section has 24 lines available for display and text is easily manipulated using single-key cursor commands. Blocks of print can be moved around or copied to new locations and the program has a fairly fast FIND/REPLACE command. For the more complex functions a simple menu is located bottom-screen to give help. Additional features include auto-repeat keys, fast data read, block movement, free-space avilable, — in fact almost everything you could desire in a word processing program.

The Formatter section performs with the aid of menus and commands available are Catalogue, Kill (this deletes one of the character sets to give enough memeory for sideways printing), Load, Print and Ramtop (which allows ramtop to be changed in Formatter 2 only).

The basic Formatter-1 takes a text file, formats it to commands which you enter and sends the results to your printer. Normal video letters are here printed as Lower case, inverse video giving capitals. The formarring commands control such things as setting of left/right margins, spacing, underlining and height and width of the characters printed.

The commmands can be given as direct commands or be incorporates within the text to be acted upon whilst printing, or both. Some of the facilities offered include line centering, line justification, banner-text, variable-sized characters, indent, and paging (larger memories only).

As with most programs of this sort the great temptation is to get right at it and start 'the fancy stuff' straight away. I suppose it is possible, But I couldn't turn many of the features off once I had started. A thorough read of the manual is strongly advised BEFORE you start!

A brief comment here about FASTLOAD, the sister program. It claims to load any program from 4 to 6 times faster than normal. In use, it certianly loaded the sample program approx 4 times faster but it was difficult to load and I was therefore unable to test the FASTWORD sections which used this system.

However, the booklet accompanying Fastload gives detailed instructions on how to tailor your own programs to utilise the facility of drastically reduced loading times. . . this alone would make it worth purchasing for the 'serious' ZX81 user. (costs £8.50)

Individually, (loading problems aside) both of these programs seem to represent real value for money. Fastword is extremely versatile and, although there are comprehensive word-processing packages such as Tasword already in common use by those with 16K, for those using ZX81 as the heart of a business package who have 32, 48 or 64K then this suit of programs demands serious consideration.



HELI MATHS and SPELLI-COPTER
Spectrum 48K
£5.95 each
Kerian UK Ltd., 29 Gisburn Road, Hessle, Hull HU13 9HZ

Finally, back to the Spectrum which, happily, seems to be gaining favour as a 'backup' machine in schools nowadays. This, I believe is mainly due to the increasing amount of relatively cheap, quality software now appearing.

Educational software has come a long way since the early days of 'drill and practice' routines. Nowadays a program must not only be educationally valid it must also be seen to offer something extra if it is to find a place in the classroom — especially if these days of restricted allowances for items other than basic textbooks.

Basically these programs do not aim to do enough to justify either the price or the heading 'educational'. The ideas behind both are very good — a helipcopter is used to aid in spelling or computation, but the structure of both programs does not proide much of a challenge for the user and after several attempts one is inclined to ask 'Is thatall there is to do?' Admittedly there is no specific age range mentioned and they may well appeal to younger children. In essence however the content could just as easily be achieved with pencil and paper. . . though the degree of motivation is obviously different.

HELI-MATHS gives the option of answering questions on any of 'the four rules' or a mixture of all. A sum is displayed in large alphanumerics and the child is required to guide a helicopter to the correct answer. Ten correct answers result in a score and congratulatory message followed by an invitation to have anothergo. Incorrect answers cause a colourful crash. The correct answer is given after two failures. The idea is essentially sound but the inability to set difficulty levels and the fact that only answers to 99 are required to make this of limited value as it stands.

SPELI-COPTER has much the same format. A word is displayed and has one of the letters destroyed by a red helicopter, it is then up to you in your black machine to repair the word by selecting one of the supplied letters. Answers are treated in the same way as Heli-Maths and, again, the penalty is, in my opinion, likely to be more appealing than the reward! There is a degree of increading difficulty inbuilt into the 116 sets of words but there is no facility to change any of these and, although the sets are based on the same sounds, only one letter ever needs to be replaced.

Put together these two programs have some nice touches, in particular the graphics and sound, but apart from that have really little to offer that has not been done better, and more cheaply, than others. In my opinion not really value for money.

Club corner



If you're in need of some contacts wherever you are, read on . . .



Llantwit Major Computer Club

Dear Sir,
This club ceased to be active as of the 20th of March 1984 and it would be appreciated if you would publish this fact in the club section of your magazine.

Yours faithfully,
DT Mountain,
Secretary,
Llantwit Major Computer Club (disbanded)

The Network

Dear *ZX Computing*,
I am the President of the Timex/Sinclair User's Group in Vancouver, B.C., Canada.

We have in our group at the present time about 150 paid up members. We publish a monthly Newsletter for our members and also the Newsletter is sent to over 25 other User Groups in North America. We also receive their Newsletters. This exchange is called the "NETWORK".

The NETWORK tends to keep all the User Groups informed on what is going on in the field of the Timex/Sinclair computers and other products.

The computers tended to are ZX81, T/S1000, T/S1500 and the T/S2068 (Advanced ZX Spectrum) and soon the new Sinclair QL computer which is to become available in North America. This should be around Christmas time or more than likely in the early Spring.

We would like to hear from other Sinclair User Groups in England and other parts of the world. Let's keep in touch and support our Sinclair computers around the world.

Thank you for your kind consideration on this matter.

Sincerely yours,
R Lussier
President
The Group's mailing address:
P.O. Box 788,
New Westminster, B.C.
Canada V3L-4Z8

Pen Pals Required

Dear *ZX Computing*,
I own a 48K ZX Spectrum and would like to set up a User Club in my area. I would be glad if you could get someone in my area to contact me at the address below. Should any of your readers wish to have a pen-pal from here who share the same interest in computers, please be free to write to me.
Any suggestions, newsletters and reviews from the readers are most welcome.

Yours faithfully,
Albert Fu,
770 Happy Garden,
Jln Kuchai Lama,
Kuala Lumpur,
Malaysia.
Tel: (03) 726953

Dear *ZX Computing*,
A plea from the heart, as I am 13 years old and own a 16K ZX81 with printer and am looking for a Pen Pal.

If anyone is interested please would they write.

Yours faithfully,
Derek Chambers,
19 Pages Lane,
Muswell Hill,
London N10 1PU

Dear *ZX Computing*,
I wonder if there's any chance of you helping me to find a pen-pal. I have a ZX81 and would like to write to anybody who programmes in machine code.

Yours sincerely,
Stephen Masters,
3 Station Terrace,
Allerton Bywater,
Castleford,
West Yorkshire.

Dear *ZX Computing*,
I'm thirteen years old and in desperate need of a pen-pal. I live in South Africa and own a ZX Spectrum 48K, a printer and I am getting a joystick interface. Can you help?

Yours sincerely,
Ian Thomson,
11-12th Avenue,
Fish Hoek,
Cape Town,
South Africa,
7975
P.S. Compliments on your magazine — I really enjoy it.

The West Yorkshire Sinclair Users Club

Dear *ZX Computing*,
I am starting a computer club, which is to be called The West Yorkshire Sinclair Users Club. Every member will receive a club magazine at the beginning of the month. the magazine will contain news, reviews, ideas, programs to try, and lots more. The cost for this is a mere £1.00 a year. For details, please write to me at:

West Yorkshire Sinclair Users Club,
18 The Drive,
Saxton Gardens,
Leeds,
LS9 8HH

ZX Users Group Of New York

Dear Club Corner,
Our ZX Users Group of New York congratulates your very informative and excellent publications related to Sinclair personal computers. We will appreciate if you would publish the details in your next issue.

Our Club was founded in 1981; currently we have members from many countries and with diverse experiences and professions. We would like to exchange newsletters with other Sinclair user groups.

If individuals wanted to join our club, they may do so, by sending an international money order of $15 per year, as subscription to our newsletter including a short description of their background and experiences.
Best regards and happy publishing.

George E Coronado,
Chairman,
ZX Users Group of New York
Box 560,
Wall Street,
New York,
N.Y. USA 10005

Mazes

An Amazing program from Danny O'Mara who resides in Basingstoke.

When I was a child in 19?? we brought books of these mazes to draw in the path from one point to the other. Danny's program recreates this difficult exercise using hardcopy from the ZX printer.

As a more advanced exercise in programming you could create a routine to draw a line around the screen under cursor control, but for now I'll hand over to Danny for a full explanation of his program.

Description

This program, although small in the amount of code, draws a MAZE on the screen and was written to demonstrate the maze building process. However, it does take a lot of data storage and the listing as given requires a 48K Spectrum. The height and width of the maze may be reduced, in which case it will fit into a 16K machine. This is accomplished by changing the variables w and h in line 10. For best results, the width w should be between 15 and 31 and the height h between 10 and 19.

After loading, the program thinks for about two minutes and then draws random, single connected mazes, copying each one to a printer if fitted. The walls of the maze are drawn black and the paths are in white. The start and end positions are marked with a dot. Sample printouts are shown.

A singly connected maze is one in which there is only one path between any one point and any other point. That is to say there are no loops. This is the easiest maze to generate by computer. The multiple path maze is more difficult to program. Pacman type games use simple multiple connected mazes. Obviously, a singly connected maze cannot be used for Pacman, there would be no escape!

The screen is divided into blocks of 4 by 4 pixels. A maze built just using the 32 by 22 character positions would be too easy to solve. The program draws a matrix of walls first and then knocks down the walls to form the maze. This is shown on the screen as it happens. The program does not use the bottom two character lines, these are left for you. You can insert lines into the program to print the values of the various variables here and monitor the progress of the program. A good variable to watch is v. This holds the distance from the starting point, and it is quite interesting to see it increase as the maze is built, and decrease as backtraking takes place.

A line by line description of the program is provided to enable its workings to be understood. Here are some suggestions for development of the maze program.

- The program can at times produce a single long path with short dead ends making the maze easy to solve. To prevent this, the variable v can be used to limit individual path lengths. v can be tested against some random value and backtracking forced.
- An easier modification is to have a cursor on the screen controlled by the Spectrum's arrow keys. The user uses the keys to move the cursor around the screen to solve the maze.
- Enough memory exists in the 48K Spectrum to create a maze using blocks of 2 by 2 pixels. This together with a random path length limit should create some very difficult mazes.
- For the advanced programmer, how about some code to solve the maze?

Line by line description

100	Subroutine to knock down a wall.
8000	Height and width check.
8100-8120	Set up constants.
8130-8135	Draw a matrix of walls and holes.
8140-8145	Select a random starting position and plot it.
8150	Start of main loop.
8160	Select one of the 24 random sets of directions.
8165-8172	Try the first direction and see if it leads to where we've been before. If we've already been there GOTO 8200 where we set up another direction to try.
8175-8178	We have not been here before so knock down a wall, record our position and check if the maze is finished.
8180-8190	Record the maximum distance travelled from the start and repeat the main loop.
8200	Selects another direction to try if we haven't tried all 4.
8210-8222	If all directions tried then backtrack until we can move somewhere.
8300	All finished, pot the furthest position we got from the start.

Variables

w	width of maze — up to a maximum of 31.
h	height of maze — up to a maximum of 19.
r,s	are the width and height in terms of the 4 by 4 pixels on the Spectrum screen.
array a	has dimensions of r and s and values of -1 if the point is a wall, 0 if a path which has not been visited and v, the distance from the start if the point has been visited.
done	the number of walls broken down. The maze is finished when done equals the width times the height.
v	recirds the distance we are from the starting point.
d(4,24)	a constant array containing the 24 combinations of the four compass points, North, South, East and West.

Other variables used in this program are for temporary storage of intermediate computations to improve the speed of the program.

```
   1 REM Maze
  10 LET w=31: LET h=19: GO TO 8
000
 100 LET px=xx*4-4: LET py=yy*4+
12
 102 OVER 1: FOR z=0 TO 3: PLOT
px+z,py: DRAW 0,3: NEXT z: OVER
0
 104 RETURN
8000 LET r=2*w+1: LET s=2*h+1: I
F r>63 OR s>39 OR r<10 OR s<10 T
HEN  PRINT AT 0,0;"Height or wid
th out of range.": GO TO 9999
8100 DIM a(r,s)
8105 DIM d(4,24): RESTORE 9000:
FOR i=1 TO 24: FOR j=1 TO 4: REA
D d(j,i): NEXT j: NEXT i
8110 DIM i(4): DIM j(4): DIM k(4
): DIM l(4): FOR i=1 TO 4: READ
i(i): READ j(i): READ k(i): READ
 l(i): NEXT i
8115 FOR i=1 TO r: FOR j=1 TO s:
 LET a(i,j)=-1: NEXT j: NEXT i
8120 FOR i=2 TO r-1 STEP 2: FOR
j=2 TO s-1 STEP 2: LET a(i,j)=0:
 NEXT j: NEXT i
8125 CLS
8130 FOR x=1 TO r STEP 2: FOR z=
0 TO 3: PLOT (x-1)*4+z,16: DRAW
0,4*s-1: NEXT z: NEXT x
```

```
8135 FOR y=1 TO s STEP 2: FOR z=
Ø TO 3: PLOT Ø,4*y+12+z: DRAW 4*
r-1,Ø: NEXT z: NEXT y
8140 RANDOMIZE : LET x=2*INT (RN
D*(r-1)/2)+2: LET y=2*INT (RND*(
s-1)/2)+2: LET a(x,y)=-9: LET x1
=x: LET y1=y: LET v=1: LET max=2
Ø: LET done=1
8145 PLOT x1*4-3,y1*4+13: DRAW 1
,Ø: DRAW Ø,1: DRAW -1,Ø
815Ø LET c=1
816Ø LET d=INT (RND*23)+1
8165 LET vx=x+k(d(c,d)): LET vy=
y+l(d(c,d))
817Ø IF vx=Ø OR vx=r+1 OR vy=Ø O
R vy=s+1 THEN  GO TO 82ØØ
8172 IF a(vx,vy)<>Ø THEN  GO TO
82ØØ
8175 LET v=v+1: LET a(vx,vy)=v:
LET done=done+1: LET a(x+i(d(c,d
)),y+j(d(c,d)))=Ø
8177 LET xx=x+i(d(c,d)): LET yy=
y+j(d(c,d)): GO SUB 1ØØ
8178 IF done=h*w THEN  GO TO 83Ø
Ø
818Ø LET x=vx: LET y=vy: LET c=1
8185 IF v>max THEN  LET max=v: L
ET x9=x: LET y9=y
819Ø GO TO 816Ø
82ØØ IF c<4 THEN  LET c=c+1: GO
TO 8165
821Ø LET v=v-1
8215 FOR i=1 TO 4: LET vx=x+k(d(
i,d)): LET vy=y+l(d(i,d)): IF vx
=Ø OR vy=Ø OR vx=r+1 OR vy=s+1 T
HEN  GO TO 822Ø
8217 IF a(vx,vy)=v THEN  GO TO 8
222
822Ø NEXT i
8221 GO TO 83ØØ
8222 LET x=vx: LET y=vy: GO TO 8
15Ø
83ØØ PLOT x9*4-3,y9*4+13: DRAW 1
,Ø: DRAW Ø,1: DRAW -1,Ø
83Ø5 COPY
831Ø GO TO 1Ø
9ØØØ DATA 1,2,3,4,1,2,4,3,1,3,2,
4,1,3,4,2,1,4,2,3,1,4,3,2
9ØØ1 DATA 2,1,3,4,2,1,4,3,2,3,1,
4,2,3,4,1,2,4,1,3,2,4,3,1
9ØØ2 DATA 3,1,2,4,3,1,4,2,3,2,1,
4,3,2,4,1,3,4,1,2,3,4,2,1
9ØØ3 DATA 4,1,2,3,4,1,3,2,4,2,1,
3,4,2,3,1,4,3,1,2,4,3,2,1
9ØØ5 DATA Ø,1,Ø,2,1,Ø,2,Ø,Ø,-1,Ø
,-2,-1,Ø,-2,Ø
```

Gavin Smyth triumphs again with another all action machine code masterpiece



Meteor madness

Remember 'METEORS' on the first games tape for the ZX81? In my opinion, it was the best game on that tape, but it did have a few disadvantages:

The graphics could be better.
The ship is at the top of the screen and 'moves' down: the opposite would be more convenient.
The ship moves across the screen and so can be 'trapped' at the edges with no chance of avoiding the asterisks.
Finally, since the game is in BASIC, it is quite slow.

This game for the ZX Spectrum (16K or 48K) overcomes all these and has a few extra features. It is written completely in machine code and uses smooth high resolution colour graphics with continuous sound. The ship cannot be trapped at screen edges because it stays in the centre while the meteorites flow past (or into!) it.

The program has three separate pixel scroll routines to achieve this and these can easily be altered to be called from BASIC for your own programs. The game also has an eight digit score counter, although so far I have only needed the first four!

You are in empty space when a meteorite appears on your long distance green radar screen. Soon you can spot it on visual — as it gets closer, it glows red hot. (Who cares if there is nothing in space to make it glow? It still looks interesting on screen.) Can you avoid all the rocks in the increasingly dense meteor storm?

Occasionally, 'antimatter asteroids' show up on the screen — if you can hit these exactly on the nose of the ship, the whole screen is cleared of meteors, giving you a short time to recover. The test for this is simple, so some other meteorites may be found to contain some antimatter! Colliding with anything else reduces the strength of your shields — after five hits, you are spectacularly blown up.

Entering the program

The method of entering the program is slightly different for 16K and 48K owners, but whichever machine you have, first enter the four line "initial program' listing and SAVE it by SAVE "meteor" LINE 1 on the piece of tape you will use for your final program. Rewind and VERIFY and then leave the tape at this position to record the machine code on once it has been entered.

48K Spectrums

Type in the listing of DATA statements and add the 48K loader program to the end of your program. I suggest you save the final program in case any errors get through, although a checksum has been built in, it's not foolproof!

RUN your program and correct any errors in lines indicated. Should the program crash then type PRINT a and press ENTER, the number displayed is the line in which something is wrong. Check and correct it.

16K Spectrums

Do not type in the DATA listing, but enter the 16K loader program. Run the program and enter the DATA of each line, a whole line at a time. The program will tell you of any errors and you'll have to re-enter the whole of that line. Should the program crash, type PRINT a:GOTO 9033 and press ENTER. Re-enter the line whose number is displayed on the screen.

Both Spectrums

When the "SAVING PROGRAM" message appears, put your original tape into the recorder (the one with the initial program recorded on it), start recording and press any key as for a usual SAVE.

It may be prudent to make a back up copy by typing GOTO 9100, enter and saving on a spare piece of tape of tape until you're sure your master is OK.

Verify by typing VERIFY ""CODE, rewinding the tape and pressing enter and play on the recorder.

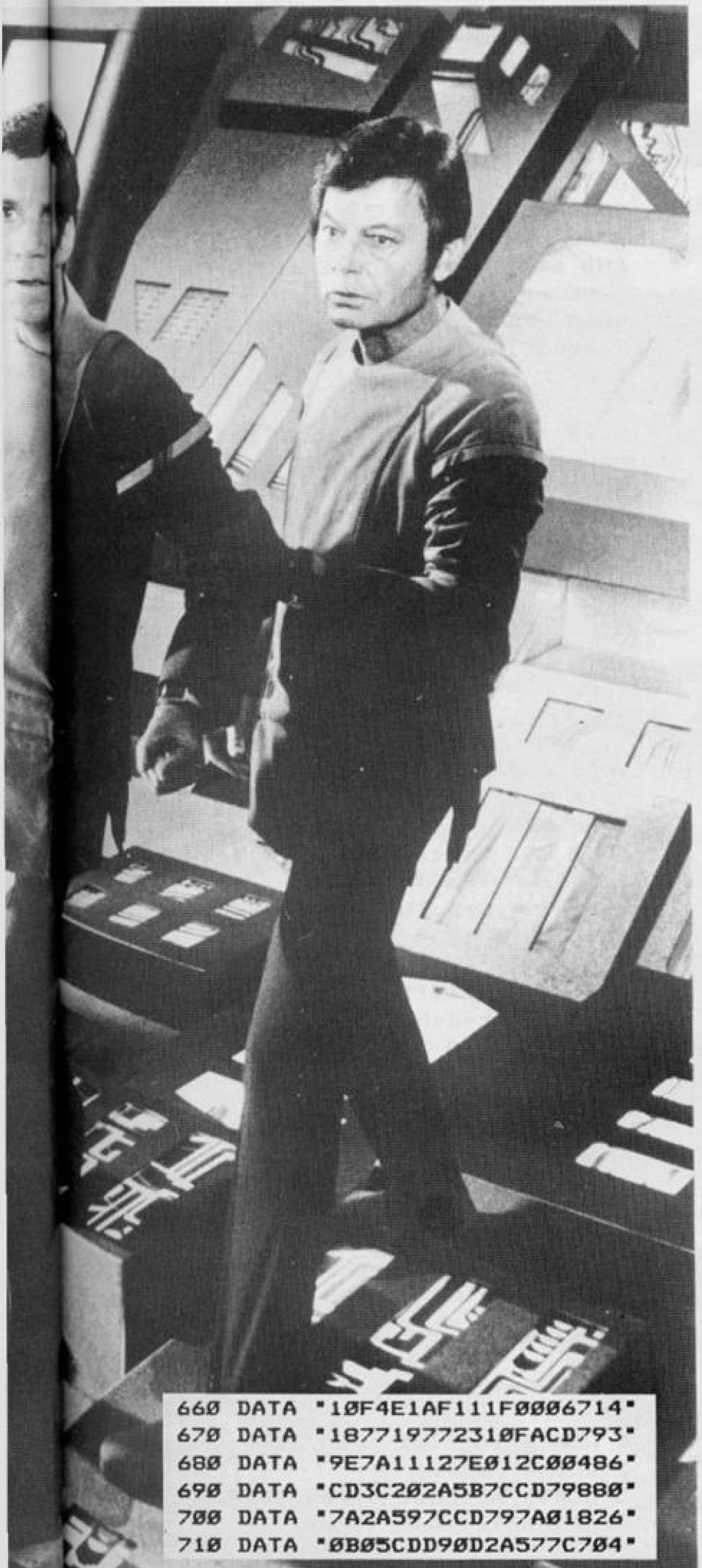
To test the program type RANDOMIZE USR 31000 and look out!

To load in the game on subsequent occasions position the tape at the start and type LOAD "". It will load, autorun, load the machine code and start the game.

```
10 DATA "F3CDDE7ACD3C7ACD1384"
20 DATA "057BCDC17ACD807A1103"
30 DATA "CD7279CDED7928F21285"
40 DATA "FE1828EBCD1D7A21942"
50 DATA "5D7C3520E2CD4579923"
60 DATA "CDFA7918D7210058936"
70 DATA "0103003E6108E5C5597"
80 DATA "CD2F7C577223CD2F864"
90 DATA "7CE610C606D3FE101055"
100 DATA "F30D20F016081B7A707"
110 DATA "B320FBC1E1083D20981"
120 DATA "DCC92A557C232255826"
130 DATA "7CE57DA7201C3A54847"
140 DATA "7CCB3FA728143254751"
150 DATA "7CF5010E04CDD90D823"
160 DATA "0600F12FD67F4FCD919"
170 DATA "1B1A111027E1A7ED754"
180 DATA "527CB5200A22557C672"
190 DATA "2A577C2322577C01534"
200 DATA "0B05CDD90D2A577C704"
210 DATA "CD797A2A557CCD791025"
220 DATA "7ACDAE7B3EFEDBFE1413"
230 DATA "E606F5280CE604CC971"
240 DATA "F37BF1F5E602CC121306"
250 DATA "7CCD887BF1FE06C01281"
260 DATA "0659CD3E7C3E523D691"
270 DATA "20FD10F6C93AB04F1061"
280 DATA "21CF4FB62323B6E6983"
290 DATA "7EC92A577CED5B5B999"
300 DATA "7CA7ED52D8200A2A910"
310 DATA "557CED5B597CED521069"
320 DATA "D821557C11597C01689"
330 DATA "0400EDB0C91EA721848"
340 DATA "D0590600CD2F7CE6909"
350 DATA "10C602D3FE10F5CD1147"
360 DATA "2F7C57E5CD497CE11114"
370 DATA "1D20E7C921000022560"
380 DATA "557C22577C3E0532571"
390 DATA "5D7C3DCD9B223E7F861"
400 DATA "32547CCD6B0D3E02647"
410 DATA "CD011611607C01B2644"
420 DATA "01CD3C202A5B7CCD760"
430 DATA "797A2A597CCD797A946"
440 DATA "3EBFDBFEE60120F81237"
450 DATA "C9D5E51E30C3301A990"
460 DATA "CD2F7CE604C60257897"
470 DATA "CD2F7CE620C610B21030"
480 DATA "210F5A011F007223319"
490 DATA "7723720972C91609623"
500 DATA "3A5D7C3D673E04BC693"
510 DATA "2002160DE521BB5A608"
520 DATA "4F06001E08091D20193"
530 DATA "FCCD497CE13D20E71203"
540 DATA "C921547CCD2F7CA6984"
550 DATA "C0CD2F7CE61F0618859"
560 DATA "4F0CCDD90DCD2F7C902"
570 DATA "E607C690D7C921601124"
580 DATA "7E227B5C3E07218D618"
590 DATA "5C77233EFF773A78860"
```



```
600 DATA "5C6FED5F67225E7C890"
610 DATA "2601D92100002259412"
620 DATA "7C225B7CC9CD6B0D899"
630 DATA "3E02CD0116110058397"
640 DATA "D5213E7E0611C57E780"
650 DATA "23462312131 0FCC1638"
```



```
660 DATA "10F4E1AF111F0006714"
670 DATA "18771977231 0FACD793"
680 DATA "9E7A11127E012C00486"
690 DATA "CD3C202A5B7CCD79880"
700 DATA "7A2A597CCD797A01826"
710 DATA "0B05CDD90D2A577C704"
720 DATA "CD797A2A557CCD791025"
730 DATA "7A010E04CDD90D06582"
740 DATA "003A547C2FD67F4F733"
750 DATA "CD1B1A060421BB50568"
760 DATA "11080019E5D5C5CD894"
770 DATA "8B7BC1D1E110F4211182"
780 DATA "D0591647CD497CC9993"
790 DATA "21D04811C07E0608662"
800 DATA "1A7724131 0FA01E1692"
810 DATA "07A7ED42EB3E0801783"
820 DATA "0300EDB001FD00EB905"
830 DATA "09EB3D20F2C911FF1052"
840 DATA "4F0602C53E08083E424"
850 DATA "07626B25E5012000511"
860 DATA "EDB8CD3E7CD13D201114"
870 DATA "F0010007 09E50120519"
880 DATA "00EDB8D1083D20DE953"
890 DATA "01E006ED42545D01712"
900 DATA "200009EBEDB8C110906"
910 DATA "CA2100400620 7723491"
920 DATA "10FCC93E8021FF4F1026"
930 DATA "011F00545DA7ED42679"
940 DATA "46CB10EB0620CB16787"
950 DATA "2B10FBCD3E7C3D20794"
960 DATA "EAC93E8021004001723"
970 DATA "1F00545D0946CB18514"
980 DATA "EB0620CB1E2310FB808"
990 DATA "CD3E7C3D20ECC9E51150"
1000 DATA "2A5E7C237CE61F67783"
1010 DATA "225E7C7EE1C9D95F1116"
1020 DATA "7CEE1067D3FE7BD91286"
1030 DATA "C972011F00097223505"
1040 DATA "722372C900000000464"
1050 DATA "000000000000000000"
1060 DATA "16000748696768 20445"
1070 DATA "73636F7265200D90729"
1080 DATA "97909190209220 93941"
1090 DATA "93209192912094949 43"
1100 DATA "20919291209393 20826"
1110 DATA "92209091909790 16928"
1120 DATA "03094D4554454F52472"
1130 DATA "495445530D0D0D59437"
1140 DATA "6F752061726520747 20"
1150 DATA "726176656C6C696E861"
1160 DATA "67207468726F7567800"
1170 DATA "68206 56D707479738 10"
1180 DATA "70616365207768 65765"
1190 DATA "6E2073756464656E785"
1200 DATA "6C792061206D6574716"
1210 DATA "656F720D73686F77788"
1220 DATA "73206F6E2074686 5721"
1230 DATA "2072616461722E0D613"
1240 DATA "486F772066617220679"
1250 DATA "63616E20796F7520719"
1260 DATA "70656E6574726174867"
1270 DATA "652074686 50D6D65677"
1280 DATA "74656F722073746F816"
1290 DATA "726D3F0D596F7520648"
1300 DATA "617265206E6F7420713"
```

```
1310 DATA "656E746972656C79876"
1320 DATA "20776561706F6E6C790"
1330 DATA "657373210D496620584"
1340 DATA "796F7520636F6C6C807"
1350 DATA "6964652063656E74764"
1360 DATA "72616C6C79207769804"
1370 DATA "746820616E0D616E679"
1380 DATA "74696D6174746572874"
1390 DATA "2061737465726F69791"
1400 DATA "64202897292C2061537"
1410 DATA "6C6C0D6F74686572775"
1420 DATA "206D6574656F7273799"
1430 DATA "2061726520626C6F693"
1440 DATA "776E206F7574206F748"
1450 DATA "660D76697369626C764"
1460 DATA "652072616E67652E704"
1470 DATA "0D0D100620202003C204"
1480 DATA "5A3E206D6F766573738"
1490 DATA "206C6566740D2020536"
1500 DATA "203C583E206D6F76612"
1510 DATA "6573207269676874790"
1520 DATA "0D5072657373696E753"
1530 DATA "6720626F746820676 99"
1540 DATA "6976657320686967783"
1550 DATA "6820746872757374818"
1560 DATA "0D0D10052020507230 5"
1570 DATA "657373203C454E54654"
1580 DATA "45523E20746F2062602"
1590 DATA "6567696E2E100716510"
1600 DATA "0012161 00F98999A530"
1610 DATA "1611109B16120148323"
1620 DATA "4947482053434F52559"
1630 DATA "4516121753434F52443"
1640 DATA "4516140A44656E73515"
1650 DATA "6974791613020020417"
1660 DATA "2060002007C002C0553"
1670 DATA "1F0C00091F170009115"
1680 DATA "1F0D07081F0C0708117"
1690 DATA "1F150F031F2A0940216"
1700 DATA "00003844442C1000252"
1710 DATA "0002001018180400070"
1720 DATA "000C324438000002186"
1730 DATA "0040000822001040186"
1740 DATA "0070062000E60080268"
1750 DATA "00442A502A140200254"
1760 DATA "003C7C7E3C180000394"
1770 DATA "0018245A5A241800300"
1780 DATA "6061410103030200267"
1790 DATA "8181A3EBEFFFFFFF1660"
1800 DATA "04868A8080804000724"
1810 DATA "7E7E7A3828080000478"
1820 DATA "18183C5A5A425AFF699"
1830 DATA "21FF8421C38423E71046"
1840 DATA "C46E00767FFFFE7E1186"
1850 DATA "3C7E7C7E3E60FF06855"
1860 DATA "000000000000000000"
1870 DATA "000000000000000000"
1880 DATA "000000000000000000"
```

```
9000 REM **********************
        * 48K LOADER PROGRAM. *
        **********************
9005 CLEAR 60999
9010 LET a=0
9020 FOR i=61000 TO 62500 STEP 8
9030 LET a=a+10: READ a$: LET c=
0
9035 FOR J=0 TO 7
9040 LET h=16*(CODE a$(1)-48-(7
AND a$(1)>"9"))+CODE a$(2)-48-(7
 AND a$(2)>"9")
9050 LET c=c+h: POKE (i+j),h: LE
T a$=a$(3 TO )
9060 POKE (i+j),h
9070 NEXT j
9080 IF c<>VAL a$ THEN  PRINT "E
rror at line ";a: STOP
9090 NEXT i
9100 PRINT "SAVING PROGRAM"
9110 SAVE "MC"CODE 61000,1500
```

Machine code loader — 48K version.

```
9000 REM **********************
        * 16K LOADER PROGRAM. *
        **********************
9005 CLEAR 30999
9010 LET a=0
9020 FOR i=31000 TO 32500 STEP 8
9030 LET a=a+10
9033 INPUT a$: LET c=0
9035 FOR J=0 TO 7
9040 LET h=16*(CODE a$(1)-48-(7
AND a$(1)>"9"))+CODE a$(2)-48-(7
 AND a$(2)>"9")
9050 LET c=c+h: POKE (i+j),h: LE
T a$=a$(3 TO )
9060 POKE (i+j),h
9070 NEXT j
9080 IF c<>VAL a$ THEN  PRINT "E
rror at line ";a: PRINT "PLEASE
RE-ENTER": PAUSE 100: CLS : GO T
O 9033
9090 NEXT i
9100 PRINT "SAVING PROGRAM"
9110 SAVE "MC"CODE 31000,1500
```

Machine code loader — 16K version.

```
1 REM * initial program *
2 CLEAR 30999
3 LOAD "MC"CODE 31000
4 RANDOMIZE USR 31000
```

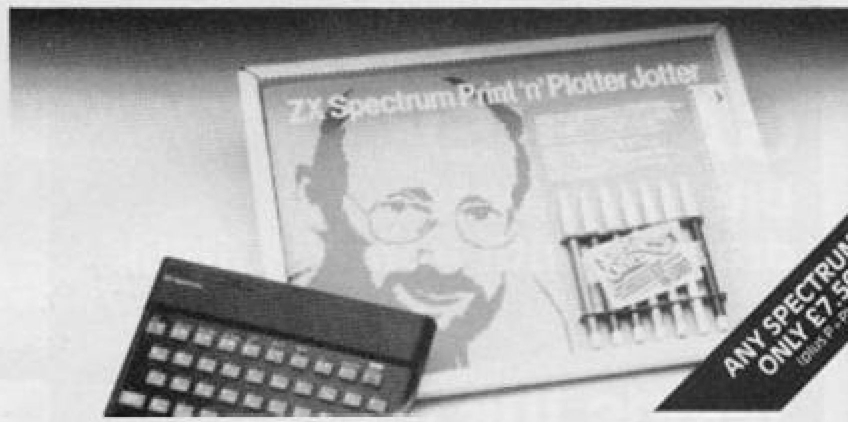
Initial program — refer to text.



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Taking the tablets: Koalapad reviewed
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GRiD lines– Compass computer reviewed
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OUT NOW

HERE'S SIX WAYS TO IN





PAINTBOX

Superb Graphics — without expensive hardware!

PAINTBOX is a must for every owner of a 48K Spectrum.

It will give you the ability to produce stunning graphics on your micro — simply.

With PAINTBOX there's no need for expensive hardware — why pay up to £150 for hardware when you can produce incredible picture and graphics with one cassette-based software package?

If you haven't seen PAINTBOX demonstrated you're in for a pleasant surprise!

For instance, PAINTBOX will enable you to draw practically anything on your screen and save it either as SCREEN$ or as a machine code memory file to use in your BASIC or MC programs.

You weild enormous power over the graphics capability of your SPECTRUM — including the definition, storage and use of up to 84 UDG's — 4 times more than normal! A brief description of facilities are as follows:

UDG DRAWING BOARD for defining up to 4 Banks of UDG's including ROTATE, MIRROR, INVERSE etc.

UDG EDITOR for storing up to 84 UDG's for use in screen planning or in your other programs.

PRECISION PLOTTER. A high-resolution drawing board which allows you to draw anything on the screen. Facilities like CIRCLE, FILL, ARC, PLOT, DRAW, ERASE, OVER, DRAW RADIALLY, INK, BRIGHT etc are included and easy to use!

SCREEN PLANNER gives you the best of both worlds! The combined use of PRECISION PLOTTER and your Banks of UDG's for highly detailed and precise screen graphics.

The program is complete with DEMO on side two of the cassette and a 28 page instruction booklet.

PAINTBOX can be used with Joysticks and is Sinclair Microdrive compatible.

SCREEN MACHINE

Instant Machine Code for graphics and text

SCREEN MACHINE is a completely professional graphics utility to use with Paintbox (or any other graphics hardware or software).

It will allow you to manipulate your screen graphics and text in ways which will make your programs better and more memory efficient. For instance:

If you have produced a screen-full of superb graphics you can enlarge, reduce, recolour, flip screen, relocate your graphics to another part of the screen, superimpose one screen on another and perform all sorts of other wonders!

Then you can take your results and put them through a series of memory compression routines to allow you to save enormous amounts of memory. Such items like compressing with or without attributes, saving thirds of the screen and multiple combinations of both are possible.

Never has machine code storage of graphics been simpler because SCREEN MACHINE automatically creates re-callable multiple screen files with a location catalogue so that you can add them to your programs!

SCREEN MACHINE also allows the user to program UDG's or text directly into machine code, so if your programs use a lot of text instructions or menus SCREEN MACHINE is going to save fantastic amounts of memory!

SCREEN MACHINE is a major graphics toolkit for the 48K SPECTRUM. It is completely menu-driven, Sinclair Microdrive compatible, and comes with instruction book and an unbelievable DEMO on side 2 of the cassette.

ADVENTURE PLANNER

A must for the adventure game fan

If you're an Adventure Game nut, Print 'n' Plotter's new ADVENTURE PLANNER is exactly what you have been looking for!

It's a 50 page, BIG SIZE (16¾" x 11¾") pad with a complete 'mapping' system with over 150 locations on each sheet . . . created to help you solve Adventure Games.

It's the best way to beat the 'system' and is obviously for use with any make of computer.

ADVENTURE PLANNER will also assist you in planning Adventure Games for programming — a helpful pad to keep by your computer at all times.

O IMPROVE PROGRAMS.





ADVENTURE PLANNER is published with instructions for use, examples, hints and tips on how to play and win the game faster.

ADVENTURE PLANNER is a high quality pad, board-backed and fly-leaf cover . . . economically priced too!

ZX SPECTRUM JOTTER
Pre-planning your screen made easy . . . and precise!

Print 'n' Plotter JOTTERS have become a household word for the Sinclair enthusiast.

Despite various imitations our original ZX SPECTRUM JOTTER is still the one people prefer!

Of course it could be because it is professionally produced . . . the quality is superb.

And the fact that it is BIG SIZE A3 (16½" x 11¾") is a distinct advantage when working in high-resolution.

It's also 100 pages thick. 50 pages of PLOT grids showing each numbered pixel co-ordinate and 50 pages of PRINT grids showing every character and graphic character position and INPUT lines.

Each page also contains 24 UDG planning grids (2400 per pad).

Consider also the fact that it is printed on Artist's Detail paper . . . thick enough to take any writing, drawing or colouring, yet thin enough to overlay onto a drawing and trace-off.

For pre-planning graphics, text, tabulation or anything to produce 'on screen', a Print 'n' Plotter JOTTER won't be beaten.

The complete package comes with a set of coloured pens, a Pixel ruler and a handy corrugated storage tray.

If you use PAINTBOX, SCREEN MACHINE or any other graphics utility . . . you'll do things better with the ORIGINAL Print 'n' Plotter JOTTER!

KEYBOARD OVERLAYS
The simple answer to "Which key?"

Print 'n' Plotter KEYBOARD OVERLAYS for the standard ZX Spectrum keyboard are the economic answer to "Which key does what?"

If you program, or buy commercially-produced software, sooner or later you'll be faced with a mind-boggling mass of keys that perform different functions.

Let's face it, the Spectrum keyboard is complicated enough so why not take the easy way to remember . . .

. . . lay over the keyboard a Print 'n' Plotter OVERLAY and write the function underneath . . . it's child's play!

Print 'n' Plotter KEYBOARD OVERLAYS come in packs of ten. Punched to fit your Spectrum. Priced to suit your pocket!

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Now it's even better because we've reduced the price!

So if you want ZX PRINTER PAPER that gives good, clear print . . . and you want it a little cheaper . . . send today for quick delivery!

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...... ADVENTURE PLANNER	@ £ 4.50
...... SPECTRUM JOTTER PADS	@ £ 9.00
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Print'n'Plotter Products

Problem page



David Nowotnik answers your questions

Low PRINTing

Dear David,
Is it possible to print to the bottom two lines of the ZX Spectrum, and clear items printed on those lines?

Stephen Bee,
Hartsholme, Lincs

Dear Stephen,
You can print to the bottom two lines of the screen by modifying the PRINT command to PRINT #1,. The syntax of PRINT #1 is identical to PRINT. There is no equivalent to CLS for clearing the bottom two lines, although the routine exists in ROM to do this. The bottom two lines are cleared using the following command:

```
RANDOMISE USR 3438
```

Faulty RAM pack

Dear David,
I have purchased a Dk'tronics 64K RAM pack for my ZX81, but I find that I cannot use all the available RAM for programs. Is there a fault in my RAM pack?

John Anthony,
Cheshire.

John,
Dk'tronics admit a fault with their 64K RAM, which they are unable to solve. The memory map which they supplied to me shows that only 16K is available for BASIC programs. The memory addresses with the RAM pack in place are: 0-8K — ROM, 8-16K — user machine code, 16-32K — BASIC, 32-64K — dimensioned arrays.

Pools storage

Dear David,
I have worked out part of a football pool forecast program for my ZX81. I wish to store individual team scores each week, and input them, from tape, as required. So far, I have been unable to do this, even with the aid of the ZX81 manual. Please can you help.

R. McIntosh
Perth

Mr. McIntosh,
I assume your match results will go into an array, the problem then becomes one of loading and saving the array on tape. Unfortunately, the ZX81 does not provide a separate SAVE and LOAD routine for arrays (like the Spectrum). However, if you can avoid the use of RUN and CLEAR, arrays may be saved on tape with the program, and reloaded when the program is brought back from tape.

The best way of doing this is to have a SAVE command within the program, for example:

```
9000 SAVE "POOLS"
9010 GOTO 10
```

As long as these lines are not in a subroutine, then when you save the program using these program lines, you'll save all the variables too and, on re-loading, the program will auto-start, preventing you from making the mistake of using RUN to start the program, and losing your data.



Big Brother

Dear David,
I am using a Brother EP44 typewriter as a printer for word processing with the Spectrum and Tasword Two program. I'd like to enter text using the EP44 keyboard; is this possible?

Philip Johnson,
Durham

Philip,
The producers of Tasword Two assure me it is possible. Send a SAE for details to Kevin Dewane, 12 Trafford Road, Norwich, Norfolk NR1 2QW.

Selective INPUT

Dear David,
I wish to include in a program an INPUT statement which will be used to select one of several strings (containing names of towns), but I cannot make it work. Can you advise me?

Martin Riordan,
Santa Rosa, Brasil

Martin,
You should place the town names in a string array, rather than a set of simple strings, as in the example you sent. Hence, I would change your program line to:

```
10 DIM a$(3,10)
20 LET a$(1)= "Aberdeen"
30 LET a$(2)= "Birmingham"
40 LET a$(3)= "Coventry"
50 PRINT "Select a city
   (A,B, or C)";
60 INPUT I$
70 PRINT a$(CODE I$-64)
```

OLD MARYLEBONE ROAD
NW1.

SHOP WINDOW



A roundup of the many units available to enhance your Sinclair computer

Alternative input

The Sinclair computers probably have a more extensive supply of peripherals than any other make of computer. In fact it is possible by selective buying to provide yourself with all the capabilities of a computer system costing far more. So once again we provide a collection of as many of the units on the market as we could cram into these pages, so that when you are wondering what to do with your Christmas present money a perusal of these pages may inspire you.

Of course, arriving on the newsagent's shelves before Xmas gives you a chance to gaze longingly at that coveted item and sigh wistfully in the presence of the possible presentee.

Many of the items have been featured in lengthy reviews in previous issues, some are to be featured. However all we are trying to do here is to give you an idea of what is around and what it will do and, as such, comments tend to be general.

The amount of space given to an item in no way reflects the performance of that product, and opinions, comments etc. are not meant to be in depth reviews, just a guide to the device which may stimulate you to find out more about it by either calling the company or visiting you local emporium.

Whilst we have made every attempt to keep up to date, due to the speed of events in this field of human endeavour, prices or addresses may change from those quoted. Some companies may even cease to exist between the writing and the publication of this article, so may I respectfully advise that you check before parting with your money.

Voice recognition units

Possibly the ultimate aim is to be able to control the machine by speaking your instructions. We are still a long way from this degree of control but two companies have taken the plunge and produced units which attempt to do this. **William Stuart Systems** were the first on the market with their **BIG EARS** unit.

This unit comprises of a fairly large box and a microphone. The connection is by a DIN socket and instructions are provided in order that you can make the necessary connections. However the unit is designed as part of a complete system and if you purchase the lot, music synthesizer and speed synthesizer as well, the whole lot simply plugs together. It will cost you 49.00 + VAT and the other two units £25.00 and £39.00 (+VAT) respectively.

If you imagine that you can lay fast action arcade games with such a unit then forget it. Each time the input is required it waits until some signal has been received then scans its data to find as close a match as possible.

This data has been set up in a "teach" mode where the word has to be repeated several times. It takes a few seconds to try and find the match, longer if a lot of words have to be scanned. The maximum amount it is practical to us is around twelve.

Plenty of information is supplied for the knowledgable programmer to incorporate this device into his own programs and it is feasible to use it with menu type software or, say, adventure games. However, the accuracy is not that good.

The **MICRO COMMAND** unit from **Orion Data** is a much more professional looking device and consists of the usual type of dead ended box which connects directly to the Spectrum's port, into which the microphone is plugged.

The software tape provided with the unit includes simple "games" and it is obviously aimed more at the average home user rather than the hobbiest as the Big Ears is.



The system is almost identical to the WSS unit in operation and has all the same problems, except that future expansion does not seem to be intended. It costs £49.95.

Although I may give the impression that these units are not very good, in fact they have provided hours of fascinating experimentation. I can see many uses apart from the novelty value, helping children to pronounce words correctly for instance, and if you are interested in the computer as a machine then they will fascinate you.

I suggest the Big Ears may be more suited to the dedicated hobbiest while the Micro Command will appeal to the more general user.



LIGHT PENS

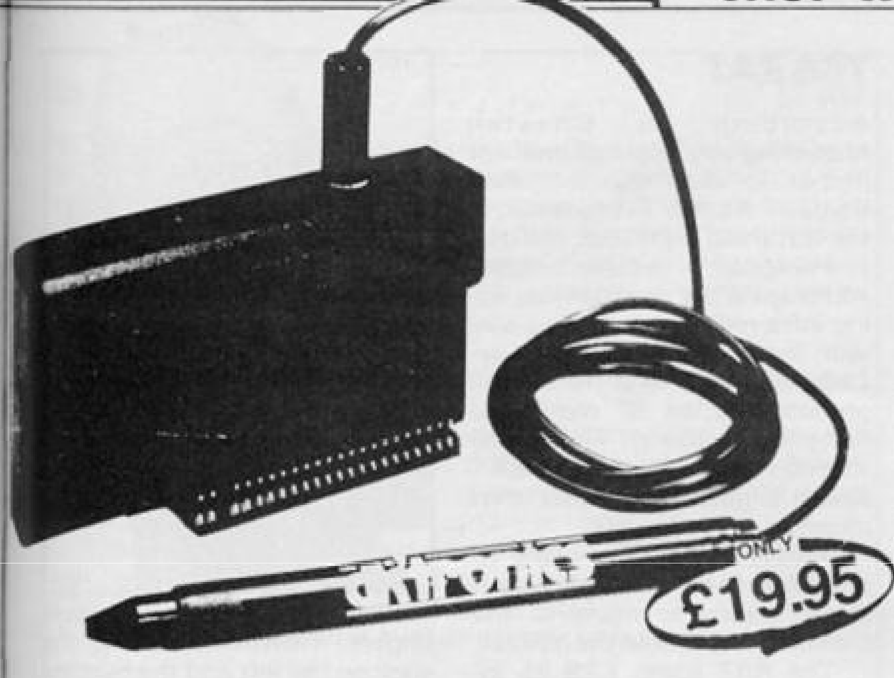
There are four on the market at the time of going to press. In the **AUG/SEPT** issue Colin Christmas reviewed the **DK'Tronics pen** and was very favourably impressed.

This comes with the standard plug in interface and the pen plugs into that. It worked very well and he recommended it as a menu selection device and also used it with some success to draw with. The interface, pen and software costs £19.95.

The **TROJAN light pen** was also looked at by Colin but he experienced some difficulty in making it operate. This unit plugs directly into the ear socket and costs £17.25 complete with tape.

CCI market a light pen and interface but I could find no information on it, it may be worth trying to contact them about it though.

The **DATAPEN** from **Datapen Microtechnology Ltd.** is the most expensive on the units on the market at £29.00. It con-



sists of the pen which is permanantly attached to a small connector for the Spectrum's port This is dead ended and you cannot add-on other peripherals afterward.

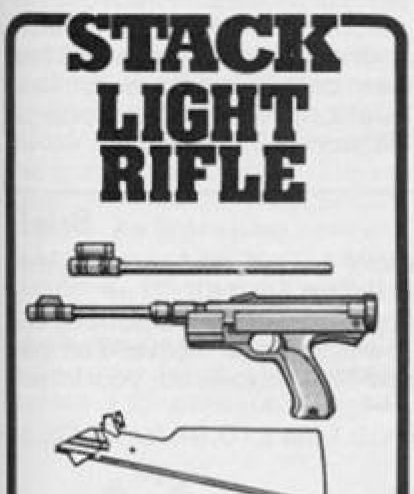
I have tried this one out and was impressed. It does everything that the makers claim and was a joy to use, the instructions were simple but comprehensive and the accompanying tape was fun to use.

The original product was designed and marketed for the BBC micro and it seems they have brought the results of their expertise to the Spectrum.

I would personally recommend this unit if you are experimenting with computer aided design or menu driven software.

Our reviewer also examined and was high in praise for the **RD DIGITAL TRACER.** This is a very versatile unit for transferring drawings from paper to the screen. This description hardly does justice to the package which includes software program control for scaling, painting etc.

There are two versions available: the "professional" at £75.00 which will work up to A3 size paper and the "standard" which does the same but only to A4 size drawings and costs £55.50. Versions for both the ZX81 and the Spectrum are supplied.



The **STACK LIGHT RIFLE** is a plastic rifle with a lead and interface which is attached to the Spectrum's port. This is virtually identical to the early modified "pong" game gun, but perhaps a bit more up market.

It is good fun and works well after fiddling with the TV to get the optimum colour balance. However no matter how hard you try, there is only one thing it can do and that is shoot at a still or moving target.

Personally I found the novelty soon wore off, but if you want an innocent and harmless way of shooting at objects or a novelty for a fete or school fund raising event then it may be worth looking at it in more detail.

The Stack Light Rifle costs £29.95.

In . . . . Brief

• **GRAFPAD** is a lightpen based unit which also consists of a unique special plug in keyboard, overlay, manual and program. Although I haven't yet seen one in action the info. sent seems to indicate that it is mainly another design/drawing aid.

Without really getting a user opinion it seems a bit expensive at £143.75, but as special discounts are offered for educational establishment. Perhaps this is the intended market.

Joysticks

Selecting a joystick is one of the most confusing tasks around. There are just *so* many!

Unlike many peripherals, the D-type connector is reasonably standard to most joysticks and computers, therefore the Sinclair owner has almost the full range to select from.

The type of joystick you buy will depend entirely on your own personal preference, they tend to be either large and need a wrist action or dainty and need a gentle finger and thumb touch. Of course there's always the unusual, the touch pad, track ball and most recently the RAT.

Nearly every manufacturer has either produced one or endorsed one and a complete account of them would take up all the room we have for the whole Shop Window, so if Ive missed out your favourite, or only give it a cursory mention — sorry!

N.B. The favourite IN word from joystick manufacturers is "ergonomically" designed. Hands-up all who really know what it means! Hands-up all those who, like me, made an intelligent guess that it meant something like "shaped to fit the hand" or "pistol grip". I looked it up, and as defined by the Concise Oxford Dictionary, it is "the study of efficiency of persons in their working environment. So all they're saying is that it is designed after watching someone play space invaders etc. for an hour or two. A pretty impressive word which means little at all.

Hands up all those who couldn't care less!

Kempston

Kempston almost single handedly established joystick control of the Spectrum and so its only fair to feature them. Their **Standard joystick** has been around almost as long as the Spectrum and still looks good. It has a short stubby stick with a ball grip at the top, this gives good control if used by placing the index finger over the top and grip the side with the thumb and middle finger. Two fire buttons are provided which makes it suitable for both left and right handed players. Recently renamed the **PRO 5000**, it has many devotees and costs £13.50.

Recently added to their range are the **PRO 1000** and **PRO 3000** joysticks. Both have the same base which has a single fire bar running along the front, but the actual sticks are very different. The PRO 1000 is the short delicate type and the PRO 3000 has a full sized hand grip with an extra fire button on the top of the handle.

These are priced at £10.99 and £12.75 respectively.

My personal opinion is that the 5000 is hard to beat although the 1000 is nice to use. Both the 1000 and 3000 seemed very plasticcy and the 3000 stick's top firing button packed up after a short while.

Suncom

From Consumer Electronics comes the best range of joysticks that I've seen so far.





(continued from previous page)

(That's not to say there's none better, just that I haven't SEEN any better). All of their joysticks are robust and weighty, you can feel that it's strong. Made for the Atari and Commodore computers they are a little expensive, but one of these will last 2/3 times that of a cheaper model. **SLIK STIK** is the cheapest at £9.95, black and red with a short, positive feel ball grip and singel L/H fire button.

The **STARFIGHTER** has the same base and fire button as the Slik Stik but a finger/thumb straight stick, rounded at the top and minus the ball. £13.95

TAC 2 (Totally Accurate Controller) is their top of the range joystick and a beautifully solid instrument it is too. If you like the feel of a firm, weighty piece of equipment which responds perfectly then save up that extra bit of money and get this one. £18.95

The **JOY SENSOR** is similar to the hand controllers used by the Intellivision TV games. It consists of a rectangular case with a circular sensor pad and a fire strip at the top.

Pressure-sensitive it was like going back to the ZX81 and, although I'm sure its much more robust, I was worrying all the time that I may be pressing too hard!

The cost, if you want something different, is £29.95.



The RAT

According to **Cheetah Marketing** you might as well not bother to read this lot, their **Remote Action Transmitter** is the last thing in joystick control.

Personally I wouldn't agee. Although it's a neat device, using infra-red signals to do away with leads, there are many arcade addicts who refer the physical action of moving a hefty stick around. The dainty thumb rubbing of the RAT doesn't quite give you that pleasure.

I must admit to limiting it, though, and personally I'd use it in preference to many of the cheaper joysticks on the market.

The RAT costs £29.95 **including** the interface which is Kempston compatible and has a through-port for other peripherals and this alone makes it worth considering.

From Emax Computing comes a new 'super joy stick', the **ARCADE PROFESSIONAL.**

If size, rock-steady weight, durability and arcade glitter impress you, then you're bound to be attracted to this one. (You'd probably also rather drive a Cadillac or a Pontiac and wouldn't be seen dead in a Mini. . .)

The Arcade Professional is big, 36 × 20 × 13cm, and weighs in at 1.88Kg on it's non-slip foam base. It's parts could be housed in a module a quarter of the size. But that's somewhat domestic and the Arcade has it's name to live up to. It offers two-handed control, the stick and two high speed fire buttons. Both joystick and buttons respond positively and sensitively



— no aching wrists or sore fingers. However, having the stick on the left and the buttons on the right will not suit everyone right away, though it's easy enough to get used to. Users may wonder why there are two identical 'fire' buttons which turn out to do exactly the same job. So did I, but then I remembered it's name and it figures. . . .

When unpacked, the unit only has a 4 way gate. An 8 way gate is supplied with simple instructions on how to change agates. But it's a fiddly job (though it doesn't take long) and it's difficult to understand why the panel is not supplied with the 8 way 'quadrant' control already set up. At a guess, few people would want to change back the other way.

Overall, Emax are offering a piece of hardware which does all that they claim it will do, certainly lives up to it's name and has been built to outlast most of it's rivals. We used it with a DK'tronics Interface.

In . . . . Brief

● Possibly the most popular joysticks around, and certainly the most easily obtainable, are the **Quickshots I** and **II.**

This is a large plastic pistol grip type stick with fire buttons on the top of both base and stick (QS.I) and in trigger from and on the top (QS.II). The QS.II also has a 'rapid-fire' feature, but your interface must be compatible.

They cost around, £7.50 for the QS.I and £10.95 for the QS.II from various suppliers.

● Recently released from **Cookridge Computer Supplies** is the **ZIPSTICK** which is a heavy duty, long handled device. Although it looks ordinary it is made with high quality materials and has a two year guarantee.

In the brief time I have had to use it I can confirm its robustness and it has quite a nice feel to it. The only thing I find disconcerting is the hefty 'clunk' when using the top of stick fire button. It's not a simple extra switch but a steel rod running the entire length of the stick to the swtich in the base.

At £12.95 its well worth trying out.

● **Electrotech** have produced a boxed joystick with three large push button controls which smacks of the 'real' arcade machines. Priced at £43.70, the unit contains a 2K RAM pcb and plugs directly in the rear of the Spectrum.

In . . . . Brief

• There are only two mechanical parts — the small firebuttons — in the **Trickstick**, a novel replacement for joysticks. You hold it in your fist and move your thumb over two phototransistors on the top for left-right and your index finger over two more for up-down. **East London Robotics** says it allows proportional speed control and greater accuracy. Kempston compatible, and up to eight can be used simultenaouesly. £28.

• The **Triga Command** looks as though it might be the shape of things to come.

From the States, the real home of the arcade game, comes this rugged joystick, with a firing button in just the right place to 'kill' all those aliens. The internal moving parts are made of solid nylon rather than plastic so that it should be stronger.

The joystick comes complete with an interface unit so that it can be plugged into the Spectrum. Triga Command is priced at £19.95 for interface and joystick complete.

The Triga Command is available from Datel Electronics.

Joystick Interfaces

Another area where there is a bewildering choice. We did an in depth survey in our last issue so forgive me if I'm even less informative than usual in this section.

Interfaces tend to fall into two main categories, with subdivisions and overlaps. There is the fixed format type and the programmable type. The fixed format can provide control for games using the cursor keys or using the Sinclair protocol or using the Kempston system or a combination or all three! For example, the latest Kempston interface provides three joystick sockets. The first will operate on Kempston's own format or the cursor control keys (often referred to as Protek system). The second two implement the Sinclair system. An impressive interface which worked perfectly. However, when used with the ZX Interface 1 and microdrives some strange things happened. I have to try it out a little longer before I'm prepared to say whether its the Kempston or the Sinclair interface which is at fault. Good value at £19.95.

Then again there's the latest **Protek interface**, this one has one joystick socket but also a three way switch which will let it work in any of the three modes mentioned.

This is one of my personal favourites and also costs £19.95.

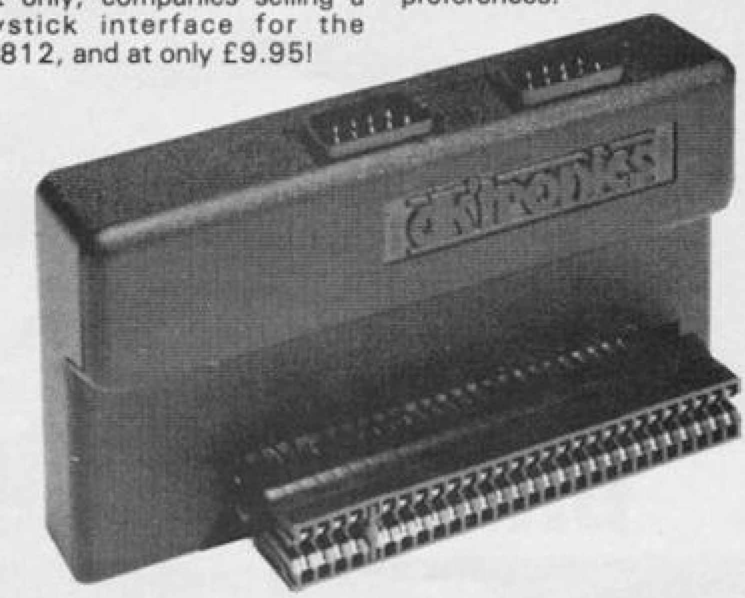
DK'Tronics must be one of the market leaders here with their two system, two-socket interface which provides for Kempston and cursor keys control for only £13.00.

OK, so what if your all time favourite game doesn't use any of these protocols (ie. something like keys ZX & MK)? In this case the solution is to buy one of the programmable interfaces on the market. These are essentially variations on two systems, either imitate the keybaord or use software or a built in ROM to effect control. The disadvantages are that they are more expensive and take more time to set up. Out of the ones I've seen I was impressed with the **Fox interface** with its built in EPROM software which can be utilised for other purposes. This is probably one of the easiest to use and it gets my full approval.

Also high on the list of my preferences are the **AGF interfaces.** This is one of the few, if not only, companies selling a joystick interface for the ZX812, and at only £9.95!

Their new **Protocol 4 interface** looks good, getting rid of the untidy wiring system of their earlier model, but as yet we haven't had one to try out.

The **DK'Tronics** is again a favourable buy at £22.95, providing a through-port and is promised to be microdrive compatible. This is not to say that the others are inferior, but again these are only personal preferences.





In . . . . Brief

• The **Stonechip Electronics Programmable Joystick Interface** is very easy to program for different games, particularly as the software is on an EPROM and not on cassette. £24.95.

• the **Fox Electronics Joystick Interface** contains a CMOS RAM, powered by a trickle-charge battery, which can store the names and keyboard details of up to 16 games for three months, say the makers. It can also be used as a pseudo-ROM for regularly-used routines. Accepts Atari-type nine-pin joysticks. Recommended at £28.50.

• The **Ram Electronics Joystick Interface** is probably the cheapest on the market. Kempston compatible, it comes with a two-year guarantee. Ram Electronics says that, unlike some others, its model will allow rapid fire with the new Quickshot II joystick. Offered through mail order and retail. Price £9.95.

• The **Sinclair Research Interface** is likely to become the standard joystick interface. It can take two joysticks and operates on keys 1-0. A ROM cartridge slot is on top and there is a selection of good quality software available on ROMs. A snag is that only the ZX Printer will fit on the rear edge connector because of the size of the slot. £19.95.

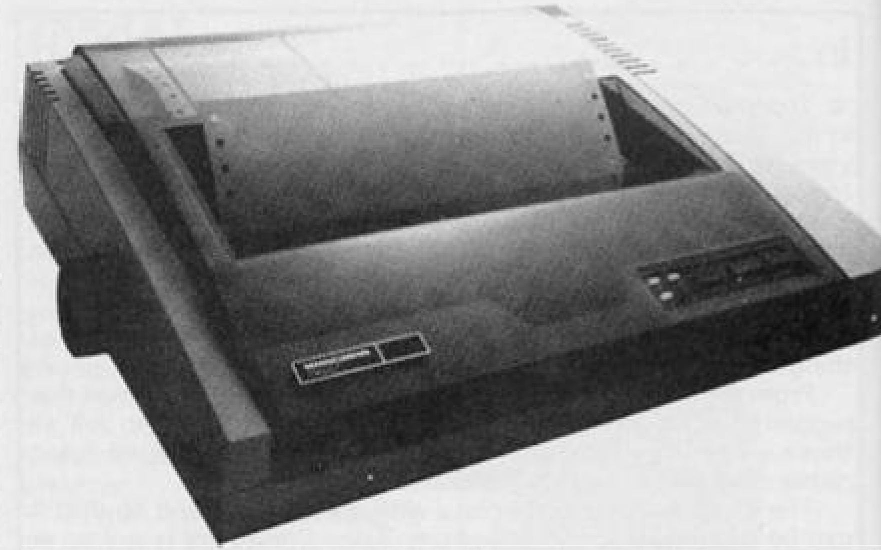
• The **Cambridge Computing Intelligent Interface** is a progammable interface which will work with any joystick. Unfortunately the program has to be loaded from tape and the keys selected every time you switch on or use a game which uses different control keys. It makes things time-copnsuming. The design isn't wonderful, but the price isn't too bad for a programmable joystick. £24. With joystick £29.90.

• Available from **Addpac Electronics** is the **Addpac JS11 joystick** and interface for the Spectrum. Complete with demo program, this package is priced at £18.99 all inclusive.

• The **Pickard Controller** is a device allowing you to connect any Atari-type joystick to the ZX81 or Spectrum. The unit also allows you to specify which keys the joystick is to emulate. The price of the Pickard Controller is £20.45, and if you want to buy joysticks from them, you'll have to pay £7.50 each.

Printers and printer interfaces





With the demise of the ZX printer we are left to find alternatives. For a long time serious users of the Sinclair machines have been seeking other means and there is a lot around. Unfortunately it also costs a lot.

The cheapest and perfectly satisfactory means of getting a printout is by buying an **Alphacom 32** printer. These now cost around £69.95 and are fully compatible with both ZX81 and the Spectrum. It's supplied paper printers blue-on-white which is a little faint, but the paper available at Tandy stores works perfectly and gives a black on white print.

However if you are not satisfied with the Alphacom then you will have to make a massive leap into the expensive market of dot matrix, daisy wheel, etc. type printers. There are many of these machine around all offering different features and advantages and disadvantages. I suggest that you visit some shops after ascertaining your exact requirements.

I bought a **Shinwa CP80** and all the Spectrum listings for ZXC are done on it. However it cannot cope with ZX81 graphics and I really needed a printer with a downloadable character set fascility.

Epsom's FX80 is a magnificent machine, it should be at nearly £400.00, and I was able to produce perfect ZX81 listing with it. However the Spectrums graphics were distorted on it!

Before the respective printer companies write in and complain, let me say that the interface that connects the Spectrum to the printer is of vital importance and affects the performance of said devices.

The most common printer connection seems to be the **Centronics** type, most printers are fitted with it but its rival, the **RS232** can usually be added (at a small cost).

Some of the more recent interfaces are: **DK'Tronics** (Centronics) at £39.95 including lead, software etc.

Kempston E which has an on board ROM which eliminates any need for loading software, easy to use and recommended.

ZXLprint III (£34.95 + £90.95 for required lead), this is the one which I use to produce the Spectrum listings for ZXC. This also has an on board ROM and is very easy to use, and has the advantage of also having RS232 compatibility as well. Very impressive.

In . . . . Brief

- The **Alphacom 32** is imported from America where it is used with the Timex version of the ZX81. Unlike the Sinclair model, it uses its own power supply (supplied). It supports all the Sinclair commands and prints in blue on white paper in slightly thinner and taller characters. The paper is much cheaper: £1 for a 25m roll. £69.95 from **Dean Electronics.**

- **Hilderbay** have produced an interface in the Centronics style for the Spectrum as well as the software to run it. Complete with one metre of cable, the package is priced at £45. Software for the Hilderbay interface is written in BASIC and machine code, and supports the use of LLIST and LPRINT, as well as including a software routine so that you can copy the screen. The software provided also includes a min-word processor from Tasword.

- **Cobra Technology** have two interfaces for the ZX81 providing connection to either a Centronics printer or an RS232 printer. The devices connect onto the back connector of the ZX81 and provide a baud rate variable under software control. Both units are priced at £26 + VAT.

- **Morex Peripherals** have put together two interfaces, both priced at £39.95, in one box, with versions for the Spectrum and the ZX81. Each package includes a Centronics parallel and a bi-directional S232 interface. With these devices you can print the full length line allowed by the printer you attach your micro to, use the LLIST and LPRINT BASIC functions, and use a selection of baud rate. The Spectrum version uses a built-in operating system allowing you to use word processing packages.

- **Advanced Digital Systems** have introduced a Centronics interface for both the ZX81 and ZX Spectrum.

Complete with one yard of cable and a Centronics plug, the package comes complete with software which recognizes LLIST and LPRINT enabling direct printouts form BASIC. This unit is guaranteed for 12 months.

As well as being compatible for both the ZX81 and Spectrum, with additional software and an inexpensive adaptor card, you can also use the interface with the Jupiter Ace.

The complete package is available from Advanced Digital Systems for £34.50.



In . . . . Brief

● The **Softest interface** allows the ZX Spectrum and ZX81 to be connected to the **Tandy** semi-intelligent printer, the **CGP-115.**

The interface allows printing and plotting on the Tandy machine, as well as a wide range of print sizes and the added facility of overprinting in different colours. The printer itself has four pen colours: red, green, blue and black; and the printing speed is 52mm/sec on the horizontal and 73mm/sec on the vertical.

The interface hardware comes complete with software, written in machine code to control the movement of the pens. With this package you can print out text, plans, drawings, program listings, pcb layouts, charts and oversize lettering.

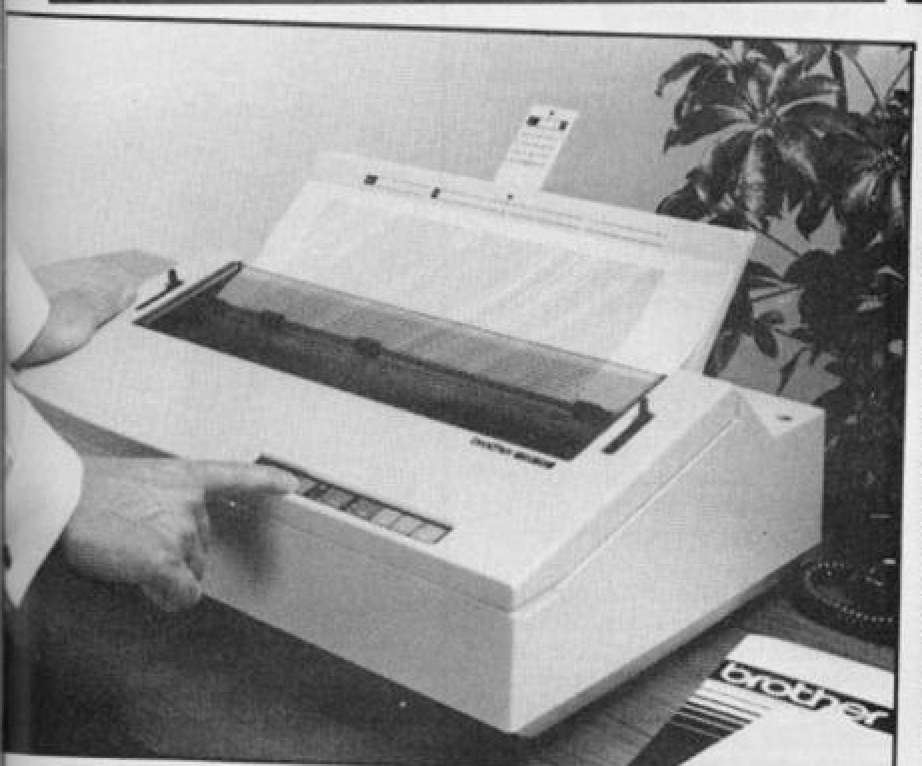
Priced at £35.

● The **Memotech RS232** is a well-designed, snug fitting interface which hold software in ROM. Finished in Memotech's blue and silvercolours, it works very well. £39.95

● The **Memotech Centronics interface** is similar in style to the RS232 version and works just as well. £24.95.

● The **Sinclair ZX Interface 1** screws to the underside of the Spectrum, tilting it forward. It controls up to eight Microdrives, has an RS232 interface for full-size printers, joystick interface, and can network up to 64 Spectrums at 100K baud. £50.







Consoles and cases

It sometimes gets tedious having to pack away all your equipment after every session and usually the first purchase is a TV for it's own use.

The next problem is where and how to keep it! I know of someone who even had an extension built on this house to put it all in (*Guess Who*)! However it isn't necessary to go to these extremes and here are a selection of alternative means of keeping it all together.

I personally use a Marcol Cabinet which houses the computer and all the bits with the TV and the printer on top. As the cabinet has two closing doors it all looks very neat when finished with. It cost me £79.95 + £5.00 p&p.

Marcol also sell the more usual open desks and their prices range from around £39.99 to £185.00 for the super-duper, all-singing version. They can be found at Solent Business Centre, Millbrook Rd. West, Southampton.

However many companies now sell similar units for a simialr price and could be better or worse, it's just that I have had no dealings or experience of their service.

In . . . . Brief

● The **Executive Case from Treetop Designs** is specifically designed for the Spectrum, this ABS plastic case combines the features of an executive case allowing you to carry your equipment around with you, and also as a console on which to work on.

The console features a raised and inclined support for the Spectrum and a secure housing is provided for the power pack giving access to the air for circulation. There is also room for a printer, cassette recorders and internal wiring. An off/on switch and LOAD/SAVE switch are also provided.

Six cassettes and spare printer paper may also be stored in the unit, and the lid, as well as room for storing leads, comprises a soft foam cushion to keep the equipment secure in transit.

The whole package is priced at £47.45.

● The **Computer Cases ZX Custom Case** for Spectrum/ZX81 is the one you may have seen in W.H. Smith. It's a briefcase which will hold your Spectrum/ZX81, power pack, printer, tape recorder and cassettes, etc. There is even space for the cables. Everything is protected by foam, which you could chop away to make space for other items, like Microdrives. The case itself is executive style in black with white metal trimmings. £38.95.

In . . . . Brief

• A Spectrum workstation is available from **Peter Furling Products** made from duable ABS plastic and priced at £16. There is a lot for the Spectrum and the associated wires are hidden away; space on top of the unit is provided for the television. LOAD/SAVE switches, speaker unit and an alloy base are provided for a small extra charge.

• In the cheaper end of the console market comes a cardboard unit from **Print 'n' Plotter Products.** Priced at £8.25, this cardboard stand provides room for a Spectrum, power supply and printer. The package has to be made up, but this is quite simple with the instructions provided. Although not room for peripherals, modifications can easily be made due to the texture of the vinyl-covered box.

• The **Desk Console** from **Traffic Technology** is a desk console constructed from heavy guage, black BS plastic with a detachable base cover and non-slip feet.

On board the console, there is room for the Spectrum, power supply, Sinclair Printer, RS232 interface, joystick control, two Microdrives, cassette recorder, cassettes and pencils etc. There is also a built-in switch which means that you don't have to alter the leads when you're LOADing and SAVEing.

The price of the device is £42.18.

• If you want to tidy up the wiring you accumulate around the ZX81 or Spectrum, there is a large black tray and stand which you can get from **Computerlock** for £31.50. With room to stand a television on top of the stand, the computer sits comfortably with all the trailing wires tucked away inside the unit.

• The **Microcase** from **Micro Aids** is just one of the products available from Micro Aids.

The Microcase, designed or both the Spectrum and ZX81, is an executive style case with a fully detachable lid. The inside is filled with foam to secure the equipment, and can contain the computer, cassette recorder and cassettes, power pack, printer and leads. The price of the Microcase is £32.95.

There is also a workstation available, which has space for a Spectrum, cassette/Microdrive and monitor. This unit is priced at £22.95

You could also ask them about their Spectrum Planning Aids, Dust Covers and various other devices.

• The **Computer Desk** from **PH Scientific Products** have a computer desk made from ABS plastic for both the ZX Spectrum and ZX81.

With recesses for the computer and printer, there is also support for a television to rest on top of the unit. The power supply and untidy wiring can be safely hidden from view.

The price of the Spectrum version if £16 and £1 less for the ZX81 computer desk.

• The **Backpack** for the ZX81/Spectrum. Six models, all with save/load and on-off switches and space for the power supply. Top of the range also has a variable sound amplifier, three 13 amp sockets, switch and neon indicator. Untested. £27.50-£12.85 from **Kelwood Computer Cases**

• **ZX81 Wobble Stoppers** are a great idea for those who get system crashes every time the Newline key is pressed. The idea is that the RAMpack is clamped firmly to the back of the computer. The prices of these may be a little steep for you, though, See also Miscellaneous section. Small flat £5.25 Small tilted £6.26 Large flat £5.75 Large titled £6.75 from **Kelwood Computer Cases.**

• The **Microstation/Work Station** for the ZX81/Spectrum. The first is tray-shaped with space for computer and peripherals. The Work Station, suitable for other micros as well, is made of stove enamelled sheet metal and has on-off switch, four 13 amp socketrs and carrying handle. Room for peripherals and the TV stands on top. Accessories: Power Base (£10.50-£11), legs (£11) and keyboard dust cover (£2.50). Untested. Microstation £7.50 Work Station desk top model £49 from **Kelwood Computer Cases.**

Keyboards

Once the bug has bitten the prime modification to the Sinclair computers is usually by adding a better keyboard.

There are several keyboards to choose from many have only recently (within the last 6 months) arrived on the scene. Probably **DK'Tronics** have been around for the longest time. Their early model was suitable for both ZX81 and the Spectrum, only the key legends and the base being slightly different. They had a lot of criticism for certain aspects of the keyboard, although basically it was a very nice unit. Their new version seems to have allowed for many of these comments, being microdrive compatible and having a space bar. It sells for £15.00.

A word of warning!

In several shops I have seen them still selling the old version for the Spectrum. Don't get palmed off with one if it hasn't got a full space bar.

This unit also has a numerical keypad to the right of the normal keys. I have been using an old version for about a year and I'm perfectly satisfied with its performance.

Tranform Ltd. sell what appears to be a similar unit for £69.95, although I've heard that it has a metal case and is better in construction. Unfortunately we've not had one to review so I cannot comment further.

Ricoll sell a good keyboard at a very reasonable price. Made in an attractive metal case and containing a full sized space bar though still being compact it costs £37.95. This one is well worth your consideration.

Advanced Memory Systems Ltd. promised to send me one of their **Low Profile keyboards** for review when I met them at a recent Microfair. It has not yet materialised, but I'll give you a full report when it does. Its price is £19.95.

Force Astro make a keyboard to go with their workstation. The **WS** costs £19.95 and with the keyboard £45.00, worth looking at and if they send us one I'll report on it in full.

Stonechip Electronics sell a keyboard for the games player. It has a built in echo amp and tape interface plus full size space bar and microdrive compatibility. I'm afraid I had to turn down their offer of a review model as they needed it returned before I could get it done. However it looks like a nice unit for £59.95.

I hope to do one of our special features on some of the keyboards available in a future



issue, so if I've left any out or your company wishes to be included please let me know!

Saga 1 EMPEROR keyboard looks a very neat and compact unit for £54.95 and is promised to be compatible with all add-ons including Interface I. Contact them at Woodham Rd., Woking, Surrey.

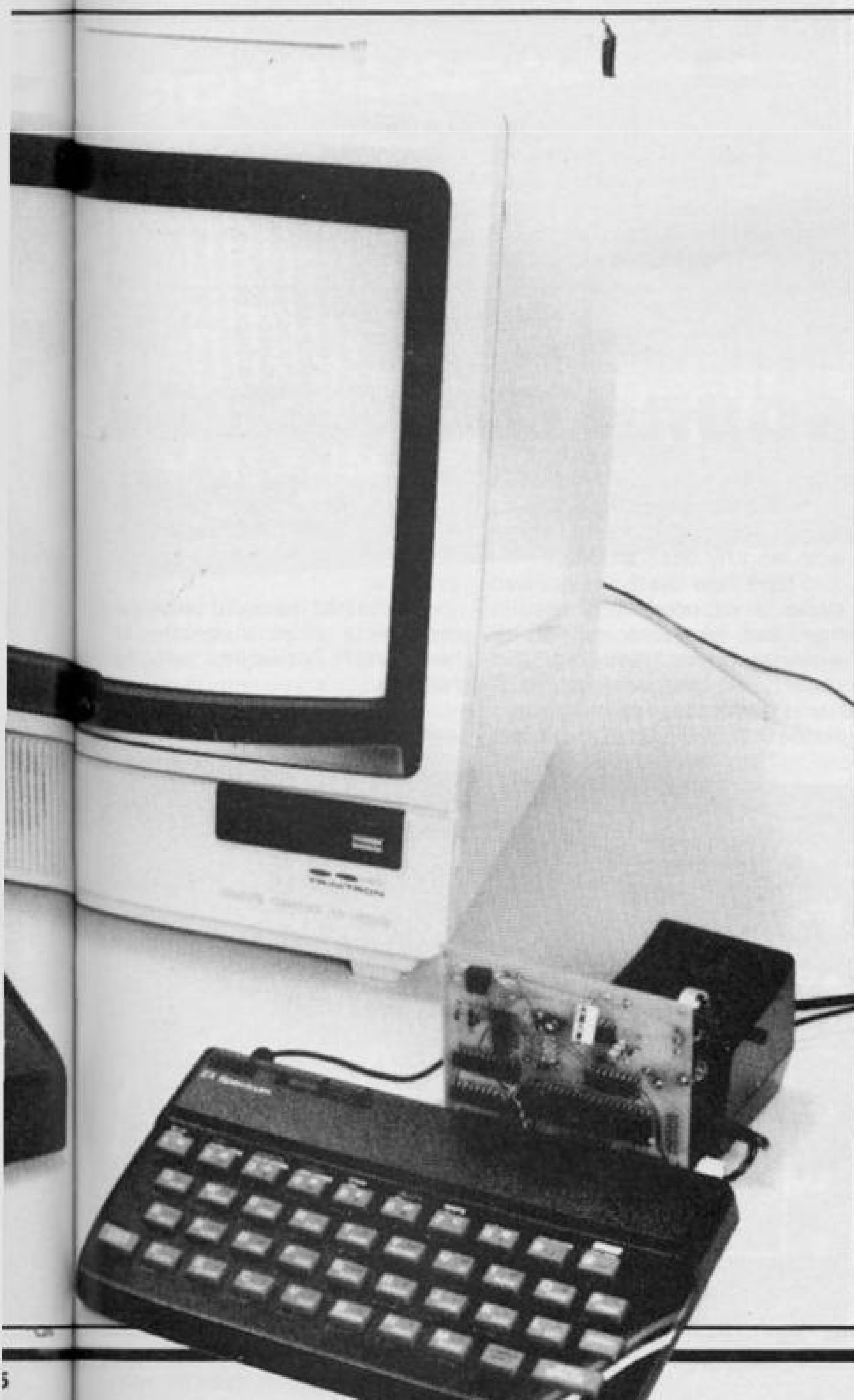
In . . . . Brief

● The **Tactile Keyboard** from **Steatite Insulations**, for the ZX81, incorporates full-travel keys and provides the professional mechanism for proper touch typing.

The case has a low profile and the keys are angled to ease typing. A full complement of legends is supplied for the ZX81 with clear plastic inserts so that the legends remain intact over a long life.

Full instructions are provided as to how the unit is fitted. You can obtain this keyboard for £30.95 from Steatite.

● Consisting of a black ABS resin case, the **Push Button Keyboard** locates over the ZX81 keyboard providing a much improved keyboard Once attached, you have a keyboard overlay with raised keys which provide a positive feel to them when pressed. Priced at £9.95, you can find out more about this inexpensive keyboard alternative from **Filestixty Ltd.**



In . . . . Brief

● **Custom Key Panel Kits** from **Softeach** allow you to customize your keyboard to suit all the different pieces of software you use.

For example, in some games the keys you need to press to move right and left are often the '8' and '5' keys respectively – however, as you all know, other games can be completely different and require a staggering number of keys to properly play the game. With this kit, you can now place a card over the keys and using sticky labels create uncomplicated guides for your different software packages.

Softeach provide 10 overlays and two sheets of sticky lebels, one already printed with words like 'left', 'right', 'lasers', 'fire', 'keypanel for:', etc, and the other left blank for you to make up your own labels.

The Custom Key Panel Kits are priced at £3.95 a pack.

● The Memotech keyboard is not thrilling, but it does have the advantage that you do not have to take your ZX81 out of its case – the unit just attaches via a ribbon cable. Although it is very easy to fit it does mean that you have now got two separate units. The keys, typewriter style and angled, don't feel right but the case design is quite attractive in Memotech's blue house colour. £34.95.

● The **Computer Keyboard** for the ZX81/Spectrum is a bit "boxy", but the typewriter-style keyboard – angled like a real typewriter – is quite nice. Again, the computer case is removed and it screws in and there's space for the power pack. There are two versions available, with standard or metal case. Good keyboard Standard £35. Metal £50. From **Computer Keyboards**

● For physically disabled people, there is a special series of keyboards. There is the **Desk-top Scanning device**, the **Briefcase Scanning** model and the **Expanded Keyboard** model. Each has been designed to help people with certain afflictions. The price of the units is very much dependent on the input devices used with the keyboards, so it would be best if you made further enquiries to **Possom Controls Ltd.**, Middlegreen Road, Langley, Berks. SL3 6DF or phone 0753 79235.

● **Microtext** have produced a keyboard for the Spectrum which is priced at £53.45. The keycaps are clearly marked, some in five colours, thus denoting their function. The keyboard also incorporates a cursor control pad with a 'fire' button and four sensibly placed direction buttons.

● A new concept in keyboard overlays has been introduced by **Tactile** aimed at early education programmers. The **Tactile keyframe** fits over the Spectrum, and a series of keyboard overlays can be attached. The overlays come in all sorts of shapes and colours, and the company produce compatible software which utilise the overlays.

● A new range from Spanish company **Indescomp**, all housed in good-looking glossy black boxes. Includes a novel **Domestic Controller** for the Spectrum which has four outputs to control alarms, lights, heating and so on. Untested. Keyboards are typewriter-style. Spectrum Keyboard £42.95. ZX81 keyboard £39.95. Domestic Controller £37.75 from **Indescomp.**

In Brief. . . . . Ram Units

● **Specspansion** plugs into rear edge connector to give a four-slot motherboard and a 24-line bi-directional programmable port board. A cassette is provided to give programming aid. Makers F.B. Tronics plans to make a range of additional cards for use with its board. Untested. £30 approx from **F.B. Tronics.**

● The **Model SP48** expands the 16K Spectrum to 48K of RAM and the **SP80** takes the computer to 80K of RAM. Both are in versions for issues one or two. Untested. Free with SP48: Beyond Horizons tape for advanced programming. Issue one SP48 £35. Issue two SP48 £23. Issue one SP80 £50, Issue two SP80 £46 from **East London Robotics.**



In . . . . Brief

● From **Stonechip Electronics** comes the **ZX Panda**, a 16K RAM extension for the ZX81.

Housed in a sturdy box, the pack connects to the rear of the '81 via a tin-plated edge connector. There is also an LED built into the unit to indicate that power is reaching the RAMpack.

There is no extension connector at the back of the device, bt it is possible to add a further 16K inside the box with a RAM board priced at £14.50.

The ZX Panda is available from Stonechip electronics, priced at £19.95. Telephone enquiries can be made on 0252 318260.

You might like to also ask them about their other add-ons for the Spectrum including alight pen, an echo emplifier, a programmable joystick interface and a keyboard.

● **JRS Software** have on offer a number of ICs which transform your Spectrum from 16K to 48K. The first issue Spectrum can be upgraded using a RAM board which is fitted inside the computer. Requiring no soldering, the RAM board is priced at £42.50. For the issue two Spectrums, there are 12 ICs provided, marked A to E which are to be fitted inside the Spectrum replacing ICs already in position. Installation is carried out simply by following a diagram supplied. The price of the ICs is also £42.50.

● **DK'Tronics** makes 16K and 48K RAM packs for the ZX81 and upgrades for the 16K Spectrum to add 32K of RAM. ZX81 16K £22.95. ZX81 48K £52.95. Spectrum issue one 32K £35. Spectrum issue two 32K £30 from **DK'Tronics.**

● **Computer Add-Ons** has a 16K RAM pack and a 64K model, both for the ZX81, and upgrades to 48K for issues one and two of the 16K Spectrum. ZX81 16K £22.95. ZX81 64K £52.95. Spectrum issue one 32K £35. Spectrum issue two 32K £30.

● Finished in shiny black, **Indescomp**'s ZX81 memory expansions for the ZX81 give an additional 16K, 32K or 64K, and there is a 32K version for the Spectrum. ZX81 16K £16.95. ZX81 32K £21.70. ZX81 64K £32.69. Spectrum 32K £28.50.

● **Cheetah** says its 32K upgrade for the 16K Spectrum has been specially designed to avoid wobble. £39.95 from **Cheetah Marketing.**

● **Camel's 64K Dream-81** expansion for the ZX81 has an LED to show when power is on, a link option to disable the 0-16K area of RAM and is designed to accept an EPROM as an alternative. ROM-81, a memory expansion unit for the ZX81, enables you to read useful routines and commonly used data stored in an EPROM. Dream-81 £80.44. ROM-81 £17.20.

● **Audio Computers** have introduced a RAM pack, priced at £19.95, for the ZX81 to make it up to a full 16M. The unit incorporates feet to make it up to the same height as the micro and has a plastic grip which hangs over the top of the ZX81 holding the RAM pack in place.

In . . . . Brief

● **Memotech** provide a wealth of hardware add-ons for the ZX81, including a number of memory packs.

Called **Memopacks**, the units fit snugly onto the back of the '81 and can be stacked together to further enhance your micro system. To simply extend the memory capacity of the ZX81, you can add the 16K, 32K or 64K Memopaks, which are priced at £29.90, £49.95 and £79 respectively.

To extend your micro system still further, you could always add one of the other three Memopacks which provide a High Resolution Graphics package, a Centronics Printer Interface, and an RS232 Printer Interface. These are all priced at £39.90.

You could also ask Memotech about their ZX81 keyboard if you're going to 'phone them on 0993 2977.

● The 16K RAM pack from **Data-assette** is priced at £28.95. You can also purchase a plug-in module for your ZX81, which when used with the RAM pack will expand your memory up to a full 32K. The price of this unit is £29.95.

● For issue two Spectrums only, there is a Spectrum upgrade to 48K available for only £24.50. For further details, get in touch with **Fountain Computers Ltd**, Darvill Road, Ropley, Alresford, Hants SO24 0BW. You could also ask them for their instructional sheet concerning the way to get the best out of the display of the Spectrum. Priced at £1, this A4 sheet shows you how you can get a marvellous display simply by adjusting a few internal controls of the Spectrum.

● You can upgrade your Spectrum, either issue 1 or issue 2, from 16K or 48K using a RAM kit from **Delta Research Ltd.** Free with each RAM kit comes **Delta Chipchek**, a memory diagnostic cassette providing computer standard testing of the existing 16K RAM and the 32K extension. The issue 1 RAM kits are priced at £37 and the issue 2 versions are priced at £31.

Speech and sound

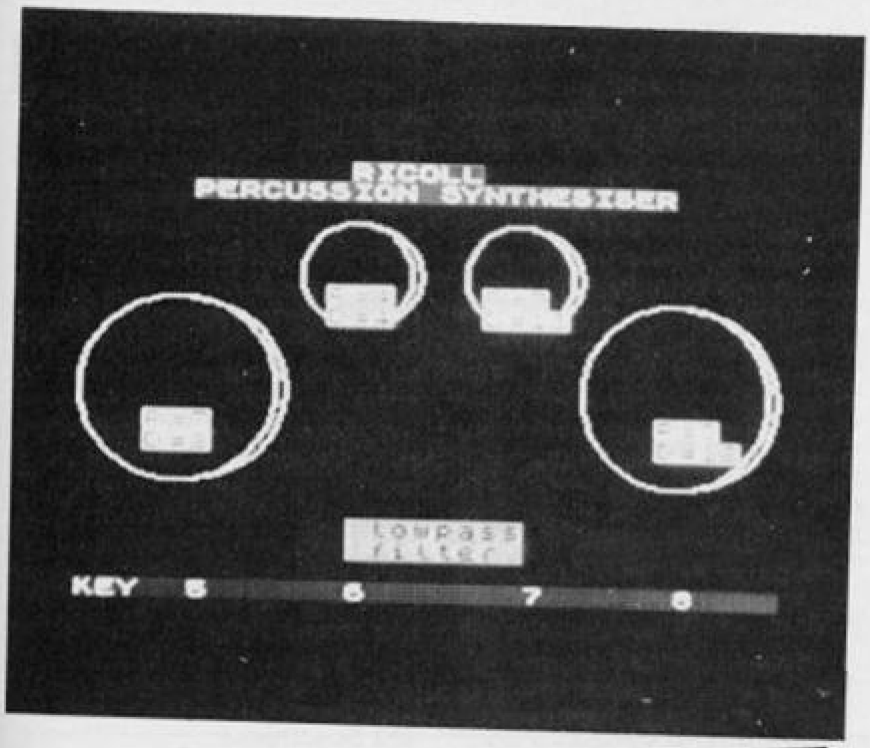
We had feature item on speech units in a recent issue so, again, I'll not take up too much time with lengthy descriptions.

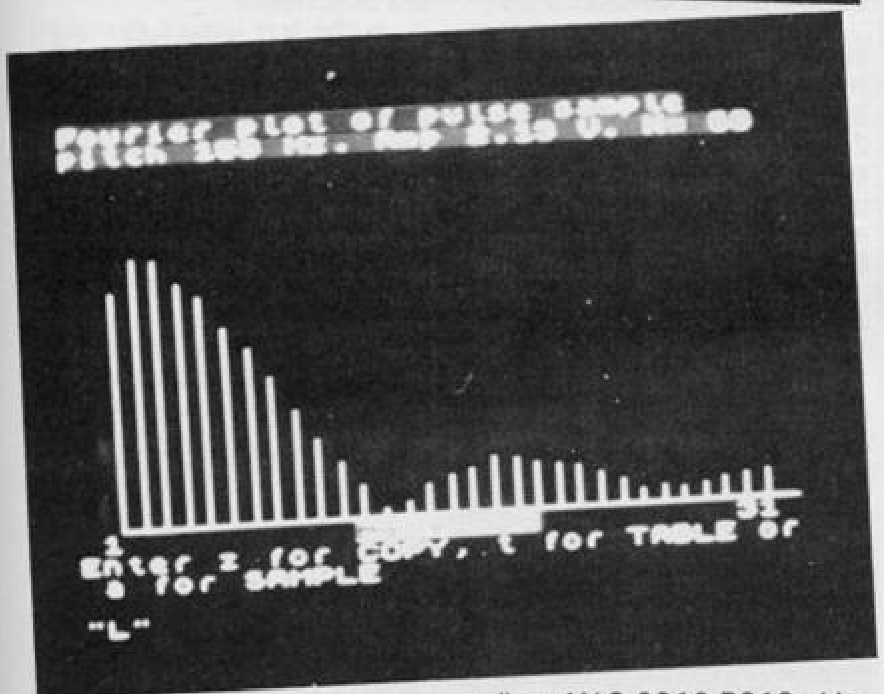
There are essentially two systems of producing speech from the computer, either by replaying prerecorded, digitised speech or by constructing it from phonemes or electronic phonetics. The first is clear, but limited to the words programmed and also expensive in memory, while the second is more flexible but rather robotic in sound.

Of the half dozen of so on the market, a brief summary of reviewer's opinions are as follows:

Sweet Talker; fair speech, easy to use, built in amp and







speaker **Currah MicroSpeech**, very easy to use, the games players choice as some software companies are producing programs featuring this system (with carrying degree of success); **S-Pack**, superb quality, limited vocabulary, ideal for educational purposes. Expensive; **Chatterbox**, the serious users choice. Built in amp and speaker, designed for both ZX81 and Spectrum, part of the complete system of voice recognition and sound generator. **William Stuart Systems**.

Sound

This is becoming almost a specialist area of computing. Many units such as the **Midi** will allow you to connect your Spectrum to one of the cheaper musical keyboards available such as the **Casio**.

However, there are many units which make use of the excellent AY-3-0910/8912 chip.

For the sound specialist I would recommend looking at **Ricoll**'s extensive range of sound generating units, which have many complex and sophisticated variations such as digital filters and half-octave analysers.

William Stuart Systems sound box works best when used in conjunction with their other two units, the speech unit providing it with an amplifier. I loved this one and was very impressed with the support software, the **ARP** (arpeggio or note sequencer) program kept me fascinated for hours. I was sad to have to return this to them and was very tempted to buy one. Should interest musical computerists with limited technical knowledge.

Cheetah have just brought out a **BEEP amp**. It plugs into the port and is connected to the ear socket. At £9.95 it may be what you need if all you require is an amplified Beep

DK'Tronics yet again, are into this area of the market. They have two units which look identical and consist of the usual interface plus a 4" pod mounted speaker. One costs £14.95 and is a simple BEEP amplifier and the other costs £29.95 and as well as boosting the beep also contains the AY-3-8912 sound chip to provide 3 independant channels with envelope and volume. Very similar to the sound on the BBC.

The **Trichord** is a sound unit for both ZX81 and Spectrum. The latest version does not contain the pre-programmed EPROM but the software is provied separately on tape. It is obtainable from **Newtech (micro) Developments**, at 1 Courtlands Rd., Newton Abbot, Devon, TQ12 2JA. Tel 0626 62836 and is priced at:

ZX81	
without amplifier	£24.95
with amplifier	£26.95
Spectrum	
without amp	£26.95
with amp	£28.95
	+£1.00

for a beep amp socket to be fitted.

As a special Christmas present to all our readers they are offering £2.00 off any unit until Jan 30th 1985. Find the coupon printed somewhere in these pages and send it with your order for your discount.

In Brief. . . . . Speech and Sound

● **The Sweet Talker**, available for £34.95, is designed to provide speech synthesis for the ZX81 and ZX Spectrum. The package comes complete with demonstration cassette and instructions on how to use the allophone system.

● The **Currah U Speech** for the Spectrum "speaks" the letters and the BASIC keywords as you type them in. S$ will hold anything you want the unit to say. It is simple to use with your own BASIC programs, by handling the sound in a form of allophones. So you would write hello as HE(LL)(OO). Upper and lower case decide intonation. Some commercial software makes use of U Speech for games. An example is **Bug-Byte's Birds and the Bees**. Shaped a little like a black cassette case — and packed with circuits inside — the U Speech unit just plugs into the port. Its one big problem is that you cannot plug anything on the back apart from the speech unit and, possibly, Microdrives. The sound comes out of the TV speaker, so if you use a monitor this will not work with it. £29.95.

● The **Chatterbox** for the ZX81/Spectrum is another add-on in the sound line from William Stuart. But this time instead of understanding your speech, it speaks to you through its own speaker. It uses allophones which are acceptably easy to program. Chatterbox is equipped also with two external amplifier sockets — one stereo and one mono — and has an edge connector for other peripherals. Pretty good, £45.00 from **William Stuart Systems**.

● The **S-Pack DCP Microdevelopments** is an upgrade of the Digitalker, an old speech unit for the ZX81. Now designed for the Spectrum, you can get hold of the S-Pack for £49.95.

The unit comes supplies with a vocabulary of 71 words, phrases numbers and letters. These can be called from programs using simple BASIC statements.

Should you get bored or feel confined with this collection of speeches, you can always purchase one of DCP's other three Word Packs, priced at £14.95, which come as ROMs.

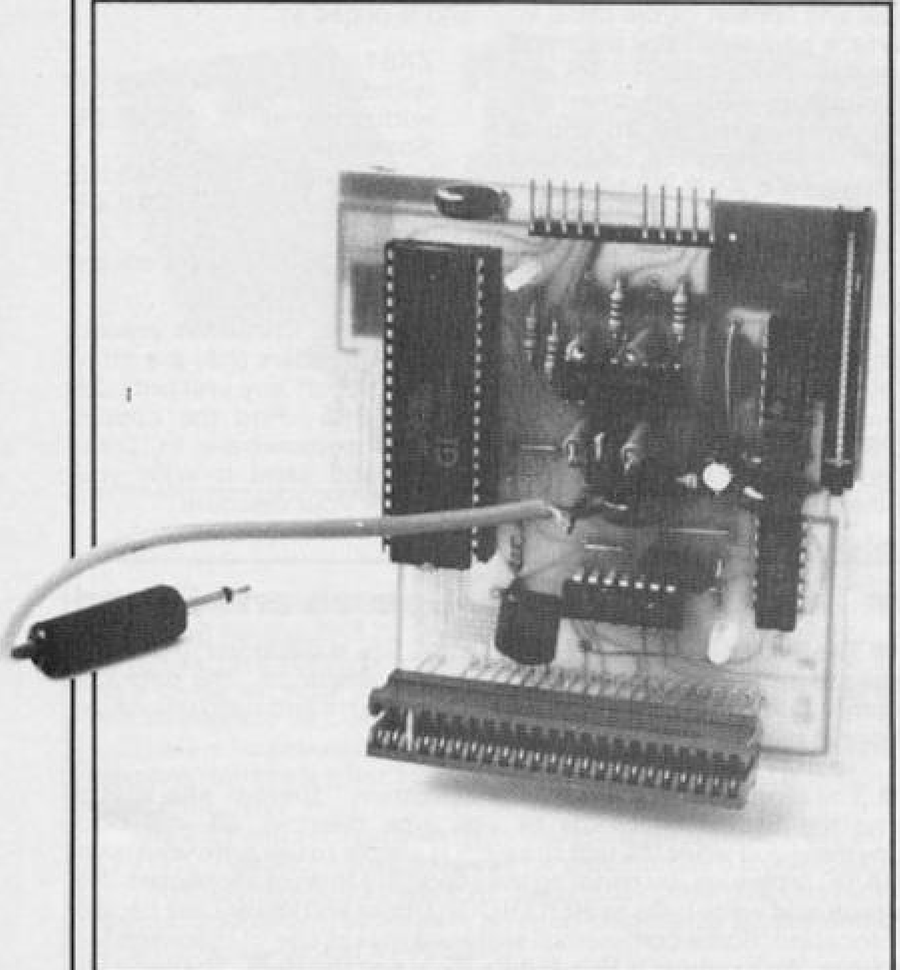
● Not tested, **Zeal's Sound Booster** has a 3in loudspeaker, load/save feature to avoid plugging and unplugging plus a volume control knob. Plugs in externally and requires no batteries. Mail order. Rating based on price and supplied details. £14.99 from **Zeal Marketing**.

● The **Telesound BEEP Booster** is an upgrade of the Telesound 84 unit; the new unit can be fitted not only to the issue two Spectrum, but also to the issue three Spectrum.

The BEEP Booster allows you to amplify the sound from your Spectrum through the television speaker so that you can really make the most of the more 'noisy' programs available on the market. Measuring only 2cm by 1.2cm by 1cm, it is claimed to be the smallest modulator in the world.

The BEEP Booster is connected inside the Spectrum via miniature plated clip which push onto the connection points.

The Spectrum Add-on from Micropower.



Utilities

Home computing started as a hobby for many who were interested in electronics and who probably built their own computer! The wheel has to some extent come full circle and more and more computer owners are dabbling with electronics in some form. The response to our hardware interface project has been surprising and more companies are making equipment available to the home computer market.

Camel Products, Cambrige Microelectortnics Ltd. 1 Milton Rd, Cambridge CB4 1UY have a range of EPROM related products such as the PROMER SP which allows programming and checking of 8K or 16K EPROMS. This costs £29.95.

The ROM SP loads and runs instantly up to 16K of program from an EPROM and two EPROM erasers, the DHOBI 1 & 2. Also from Camel is a Power Buffer unit to protect against mains power failure and some mains interferences. ZX81 and Spectrum versions are available.

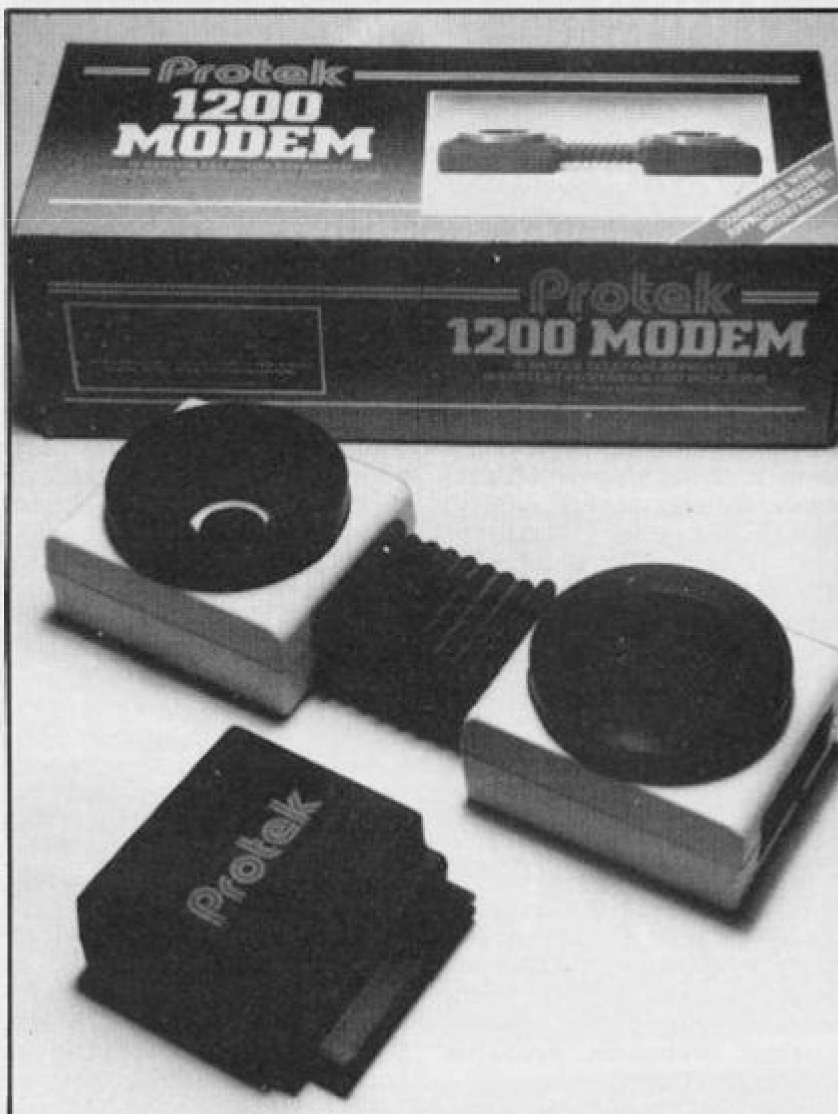
The world of Modems and communication networks may be slightly different, but have a lot in common with the dedicated hacker. MODEMS or MOdulator DEModulators, are a fast growing area of the computer industry.

These are the units which enable you to connect up to the phone lines and communicate with another computer. The main computer which is accessed by the home computer user is BT's **Prestel** system and **Micronet 800**. To do this you must have a BT approved Modem. There are two I know of, **Prism's VTX 5000** which connects directly into the modern telephone socket and **Protek's 1200** Modem which is acoustically coupled. (ie. the phone is placed into a special unit which is the connected to the Spectrum.)

In the last issue I described how I joined the Micronetters and can only reiterate that I find it a fascinating and enjoyable pastime.

Skywave Software will provide you with a FORTH ROM for your Spectrum or ZX81. This is a sophisticated version of the language and is ideal for control applications.

It'll cost you £15.00 + VAT from Skywave Software, 73



In . . . . Brief

- Easily adapted for a variety of uses come the **BEEP Amp** from **Hypnotech.** The device comprises an 8 Watt amplifier with a 10 Watt Woofer and tweeter in a small speaker unit. The unit is mains operated and plugs into the MIC socket of the Spectrum. Priced at £23.95.

- From **Bi-Pack Semiconductors** comes the **ZONX-81** is compatible with all Sinclair computers, although for the Spectrum an adaptor is required; this can be bought separately for £6.80 if you are upgrading from '81 to Spectrum.

  The unit offers a wide range of sound effects, such as pianos, bells, helicopters, lasers, explosions, etc. The sound chip used has been designed so that the pitches and volumes of the three channels and overall attack/delay envelope can be controlled by BASIC statements.

  The ZX81 version of the device is priced at £25.95 and the Spectrum model comes complete with adaptor at £32.75.

- From **Micro Power** comes the **Spectrum Add-on**, priced at £19.95. The board, once connected, provides three channel sound effects, includes a 2 Watt amplifier and loudspeaker to amplify the effects, and has room on-board for two joysticks. These joysticks can be purchased for £7.45 each.

- The **Soundbox** is the sound version of the Chatterbox. Above average three-channel sound and quite easy to program. Nice, but needs an external amplifier. £27.95 from **William Stuart Systems.**

- **Specsound** is pretty good value for an amplifier. It plugs into the load/save sockets, leaving the edge connector free. It has a volume control and an on/off switch and the power is from a battery. It might have been a better idea to take the power from the computer to avoid buying batteries. £7 from **Kelwood.**

- The **Sound Synthesiser** for the Spectrum is a plug-in module for three-channel sound with envelope control, amplifier and speaker plus two input-output ports. Untested. £28 from **Signpoint.**

Curzon Rd, Bournemouth, Dorset BH1 4PW.

Stephen Adams has come up with a number of interesting devices for the ZX81 and ZX Spectrum. The **Straight Adaptor** converts the Spectrum to the same expansion port as the ZX81, but does not do any address conversion thus providing you with a full 64K of addresses when the printer is being used. He has also developed the **Adam and Eve Adaptors.** The Eve Adaptor allows owners of the 48K Spectrum to utilise the wide range of ZX81 peripherals (as long as those devices operate in the 0-16K section of the ZX81's memory map. The Adam Adaptor simply allows you to add a Sinclair compatible RAM pack to your 16K Spectrum, thus doubling your storage at a stroke. The Adam II Adaptor, an update of the Adam Adaptor, allows the use of two sets of peripherals at the same time on the 16K Spectrum. All the adaptors are available at £9. For the ZX81, Stephen has developed a programmable tape controller, the RZ1, for the Spectrum and ZX81. As well as not having to change the leads as you are SAVEing and LOADing, the cassette motor is set under program control. The price of his device is £20. Latest additions to this range include an adaptor to convert spare keys on a commercial keyboard to your own specific functions from £2.75, and a book which we hope to review soon.

In Brief. . . . . Utilities

● If you find you need some help with the PLOT, CIRCLE AND DRAW commands on your Spectrum, you may find some solace in the package from **Victa Ceramics.**

Comprising a white plastic base sheet, a clear plastic offset co-ordinate window, a clear plastic calibrated window and a clear plastic window mask with a plot sight in each corner, the **Victagraph** also includes a test design, comprehensive instructions and a number of sticky patches.

Using the various window masks over a test design, the mask over a test design, the mask will hide all the unwanted co-ordinates leaving you with the required figures.

The price of the Victagraph package is £7.50, but for more information contact Victa Ceramis, 6A Bow Street, Rugeley, Staffordshire or telephone 08894 2426.

● If you're having problems with your mains voltage when you're using your Spectrum and ZX81, the **Battpack** may be the answer. The device comprises a rechargable 9V Ni-Cad battery pack and transient suppressor, housed in a similar casing to the Sinclair Power Pack. The Battpack ensures that the voltage into your ZX81 and Spectrum never drops below 9V, thereby eliminating program crash through voltage problems. Priced at £13.95.

● The **Power Supply Regulator and "Buzz" Omitter** for the ZX81/Spectrum is a silver-coloured box about the size of a cigarette packet which fits between the power supply and the printer. It stops the Spectrum "buzz" and cures overheating problems found in the Sinclair machines. £8.95 from **P.R. Electronics.**

● The **Inverse Video Module** for the ZX81 gives the best white on black picture in my opinion, although it affects some televisions. just solder three wires inside the ZX81. A toggle switch on the outside turns it on and off. Fitted £7.50. Kit £4 from **D. Fritsch.**

● **Haven Hardware** have a great selection of add-on boards for your ZX81 or ZX Spectrum.

For the ZX81, there is a programmable character generator, priced at £15.95; a repeating key module, priced at £3.95; an inverse video module, priced at £3.50; a keyboard beeper, priced at £6.95; a keyboard entry module, priced at £2.95; an input/output port, priced at £11.95; a full size keyboard, priced at £18.95; and many more. You can also obtain these kits as fully built units although you will have to add about a quarter of the price again.

Haven Hardware also provide devices for the Spectrum including an I/O port which has eight inputs and eight outputs accessible via edge connectors on the edge of the pcb. This is priced at £12.95 for the kit or built for £16.95.

For the further information get in touch with Haven Hardware at 4 Asby Road, Asby, Workington, Cumbria CA14 4RR or 'phone 094-686 627.

In. . . . . Brief

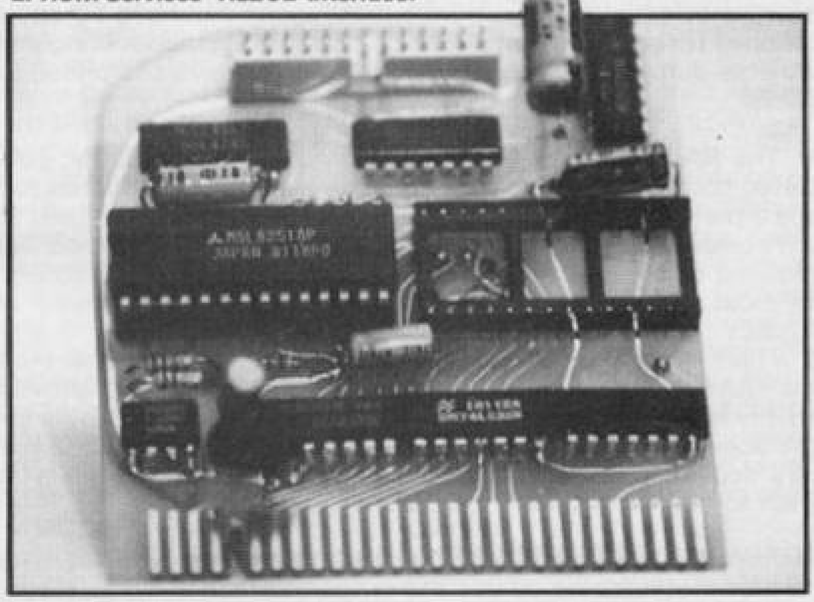
● The **Masterplug** for the ZX81/Spectrum allows four devices to be connected — for example, TV, recorder, computer, printer — to one mains outlet. Supplied with 1.5m mains lead with plug and four other plugs Inexpensive at £10.99. Available from **H & K Supplies.**

● A range of ribbon cables, 9-12ins, with 56-way connectors which could be used, for example, to separate RAMpack from the computer. Also paddle board to convert female connector to make. £4.99-£9.49. Paddle board £1.99 from **Hawnt Electronics.**

● The **Arab RAM** for the ZX81 fits between the ZX81 and a RAMpack to give a complete set of characters, keywords and functions in an Arabic version of BASIC called Saudia. Writing and evaluation of decimal numbers is from right to left. Includes instructions booklet and keyboard overlays are available. Contact **Autoram.**

● The **Zeaker** is a "buggy" which has more use in schools than in the home. Programmed in LOGO, it can be made to trundle around. A relatively inexpensive introduction to robotics. £69.95 from **Colne Electronics.**

EPROM Services' RS232 Interface.



● **EPROM Services** have a wealth of add-on devices for both the ZX81 and the Spectrum.

Price at £19, there is the EPROM board, which can accommodate up to 8K or 2K EPROM or 2K RAM ICs. This memory is located at 56-64K, but with simple modifications it can be made to relocate the board to the 48K area. They also make available an Auto Start unit, priced at £9.95, which gives an automatic jump to location FDOO Hex on switch-on.

For the ZX81, there are a plethora of EPROMs available, priced between £9.95 and £19. These can be used for rapid LOAD/SAVE, tool kit, disassembler, graphics control, character set, monitor and other uses.

However, EPROM Services are responsible for much more hardware than can be briefly mentioned here, so it might be worth you giving them a buzz on 0532 667183 or writing to them at 3 Wedgewood Drive, Leeds LS8 1EF, if you are looking for a particular application.

● A Tape loader from **Elinca Products** should help you LOAD and SAVE programs when using the ZX81. The ZX Tapeloader filters and stabilises the signals in both directions, providing a signal perfectly matched for the computer. The unit also incorporates an audio output indicator and signal amplifier to enable you to correct the input signal.

● The **MX-8** gives the ZX81 two functions controlled by on-board switch: storage of up to 10 programs to a total of 6K, plus 6K of extra RAM. Software in a 2K EPROM provides a monitor for system status. £44.90 from **Micro-Z.**

In. . . . . Brief

• The **Time Controller from Glanmire Electronics** is a battery backed real time clock. The time Controller has eight programmable inputs and eight programmable outputs.

With its own built-in program, in PROM, only a single instruction is necessary to read or write the month, day, date, hours, minutes or seconds. There is also an extension connector would you wish to add other peripherals onto the board.

Applications for this device include electronic diary with alarm, home control, burglar alarm, sound effects and process control.

The prices of this device are £34.50 for the ZX81 version and £38.50 for the Spectrum model.

• The **USP-232D** card is a dual channel serial interface using Z80-DART processor. Includes software for LLIST and LPRINT and dumb terminal emulator and a 56-page manual. **USP-I/O**, a general purposes parallel interface, provides 16 output or input lines for uses such as plotters, music synthesisers, digital-analogue-digital converters, printers. Further cards also available, along with expansion bus. USP-232D £34.50. USP-I/O £29.90 from **U-Microcomputers.**

• The **Orme Electronics EPROM Card** for the ZX Spectrum can be used to provide more facilities for BASIC programs. With the EPROM fitted in the Spectrum's ROM space you have 10 extra routines for re-numbering, editing, character manoeuvering and variable dumping. Designated EROM 1, the device is priced at £9.95.

• The **RAMLOCK Kit Adapt Electronics** is a high quality, gold plated male connector which replaces the computer connector, and a mechanical clamping device, the RAM pack is clamped to the computer securely. No drilling, soldering or special tools are required to carry out this modification. Suitable for connection to most popular RAM packs, the RAMLOK kit is priced at £7.50.

There are also a series of RAMLOK II adaptors which stop the 'RAM pack wobble' syndrome and provide an improved quality edge connector for the computer. This kit is available for the Spectrum and the ZX81 and is priced between £2.50 and £6, depending on the machine and what modifications you wish to make.

• The **MUKBUS** plugs into the rear edge connector to give a six-slot motherboard to use the range of Microtext interfaces, including a prototyping card. A power supply powers the MUKBUS Card Frame System together with interfaces, Spectrum and two micro floppy disc drives. Cards include floppy disc, RS-232/Centronics, 80-column video, 64K page mapped memory and bar code reader interfaces. Untested. MUKBUS Card Frame £59.95. Power supply £39.95 from **Microtext.**

• The **High Resolution Graphics Pack** for the ZX81 contains a 2K EPROM holding the hi-res BASIC monitor to control a 256 by 192 pixel screen, with every pixel accessible. Commands like PAGE, PLOT and SCROLL can be used to define characters, draw and plot. There is also a complete lower-case character set for word processing — but you would be well advised to buy an extension keyboard to see this feature. Compatible with ZX Printer. Schools discount £38.95 from **Digital Integration.**

• **Monicron** from **MacQuillan Electronics** has been designed to assist users by providing a convenient, consistent means of loading and saving programs on tape, the Monicron is priced at £15.95.

The Spectrum model has a built-in amplifier, while both ZX81 and Spectrum models feature a power on/off switch. All functions are performed without the need to disconnect or swap plugs. The internal, high quality components are contained in a purpose-built, injection moulded case to form a small, compact unit.

Also available is an 'enhanced' Spectrum model containing a 2 Watt amplifier and external socket for connecting a larger, audio type speaker. The price for the 'enhanced' model is £16.75.

For further information contact MacQuillan Electronics.

Storage and display

Lately some of the more sophisticated suppliers have realised the potential of the Spectrum and how it is possible to make use of some of the high quality peripherals via a suitable interface.

As a general rule it is always worth buying the best you can afford especialy if it is a standard unit. The benefit becomes obvious if and when you upgrade to another computer. A disk drive system may cost £200.00 + but it will also work on a BBC or similar, whereas a microdrive — no way.

The Spectrum was designed to work on a domestic TV. This is fine for relatively short sessions, arcade games etc. but if you do any lengthy computing or want to use Tasword II and it's 64 characters per line format for any length of time, be ready for the headaches!

Some TV's are better than others of course, but most seem to wander off channel at times and the colour crawl can be irritating.

ADAPT ELECTRONICS are a company who work away quiety producing clever devices aimed at the serious user and at reasonable prices. One of their earlier inventions was the RAMlock kit for the ZX81, now I've never seen one but a reader reviewed one and it sounded very effective.

Next they wrote to inform us of a video adaptor to convert Spectrums TV output to a composite signal suitable for a BW monitor. This came in the form of a lead/plug which plugged into the TV socket of the Spectrum. At £2.75 this was a great boon for business users as the display, naturally, is far clearer, causes less eyestrain and even 64 characters per line seem reasonable.

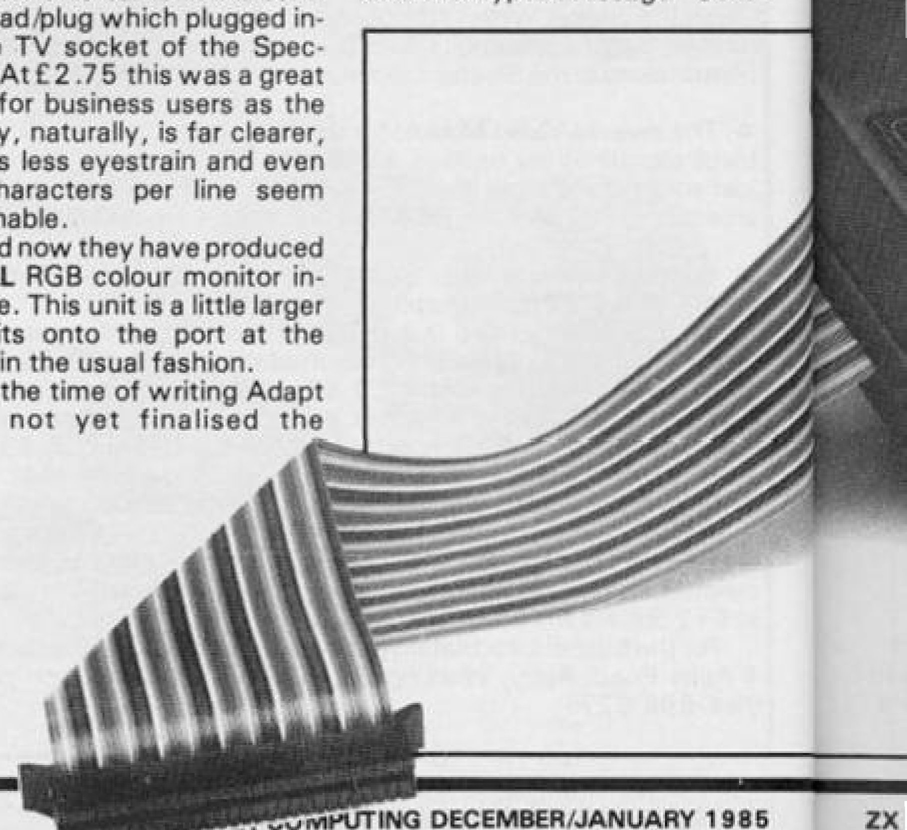
And now they have produced a **FULL** RGB colour monitor interface. This unit is a little larger and fits onto the port at the back, in the usual fashion.

At the time of writing Adapt have not yet finalised the packaging of the unit. The sample they sent was a dead ended unit with a full port connector, but they are considering a ZX81 type (shortened) connector which would make it compatible with Interface II and/or adding a through connector. Only time will tell how it ends up, but whatever they do I'm sure it'll work as well as the sample supplied!

It is actually startling to see the quality of the output of a Spectrum on a monitor. I contacted **Opus** who supply JVC monitors at the cheapest price I've seen, they were ahead of me. "Oh yes, we've seen it, very impressive." So are their monitors, £229.95 for the medium resolution version which is more than adequate for the Spectrum of £299.95 for the high resolution monitor that is specially adapted to suit the QL's 85 character per line output. Both these are very good value for money and as I said, should you later decide to upgrade. . .

All I can say is that for clarity, colour separation and definition, once you've seen the display on a monitor you'll never go back to a TV! The RGB interface costs £39.95 for Adapt Electronics and Opus Supplies can be contacted at 158 Camberwell Rd. London SE5 0EE, 01 701 8668.

Tape storage is still by far the most popular form of program storage and there are many recorders on the market which bear the cryptic message "Com-





puter compatible" The fact that the Sinclair computers were designed as being compatible with the ordinary range of tape recorders makes you wonder.

However, there are a couple of interesting ones worth your attention. The **CHALLENGE SPRINT** plus into the Spectrum's port and not the ear/mic socket. **Challenge Research** claim improved loading and saving and a four-fold increase in speed. They quote "a full 48K program will load or save in 75 secs instead of 5 mins." They are sending me one as soon as they have enough in stock, at the time of writing it hasn't appeared and their letter is dated 20.6.84. It is priced at £64.95.



The **Morwood Datacorder** is a dedicated recorder, compact and lightweight. Slide controls are used and a monitor switch. The recorder can be used with the PSU supplied or operated by batteries, a low power warning light is provided if batteries are used. It costs £24.95 but if you want to use it with a ZX81 the a booster attachment is available for a further £3.00.

I have tried it and it worked perfectly. Obtainable from Meow Micros 8, Newnham Close, Braintree, Essex CM7 7PR.

In time for Christmas is Sinclair's own "**Spectrum Expansion System**", this consists of the increasingly popular Interface I, one Microdrive, leads and a wallet containing four microdrive tapes. The tapes contain Tasword II and Masterfile one, probably the best wordprocessor and card file programs on the market, and Games Designer and 3D Ant Attack on another, a very impressive game and utility. One tape is blank and the fourth contains the usual demo program plus a tape to Microdrive utility. This is useful but does not transfer all programs.

The reliability of these units seems to be OK. I must admit t having some doubts as the first one I saw failed to work. However this one has performed perfectly with constant use for nearly a month now. Obviously it will take a period of many months before I can say with conviction that this is a realiable storage medium.

In my opinion this package represents good value for money at £99.95.

Transform Ltd. 41 Keats House, Porchester Mead, Beckenham, Kent, can provide you with a very nice black case in which to keep those elusive microdrive tapes. A very good ideas as they're too expensive to keep treading on. A box will hold ten, tidily and safely. A good idea.

The **WAFADRIVE** from Rotronics looks very interesting at £129.95. A similar unit (Interface I + two microdrives + Centronics interface) would cost around £185.00. This is an all in one twin loop tape drive with Centronics and RS232 ports. Its appearance is very smart and it also has the advantage of using less expensive tape to the Microdrive ones, £3.95 compared to £4.95 an with 128K capacity! Plus a wordprocessor supplied on tape with each unit. The success of this will depend on how easy it is to transfer programs to its tapes and how many companies can be persuaded to provide software in this form. Meanwhile I'll get a full review of it for the next issue.

And so on to their most universal of the storage systems, floppy discs.

Although rumours of such controlling interfaces have been around for a while it has only been recently that I have been able to actually use one for any length of time. This is, of course, the interface from **Technology Research Ltd.** of Staines. Having used it for around two months now it still functions perfectly and I would dread to go back to a cassette based system.

The **Viglen Drive** I am using with it has also performed like a dream and I wholeheartedly recommend this system to anyone who wants safe, efficient, fast and reliable storage. For full details see my article which should be lurking around in this issue somewhere.

I noticed that Opus are advertising a disk drive system for the Spectrum and I'll try and get them to supply me with one for full assessment in a future issue. They are a respected company with a lot of experience so it should be worth considering.

Thurnell have developed a dedicated 3 inch disk drive complete with interface attached for £199.00. They sent one for review but it has just arrived and I won't be able to even unpack it in time for that press deadline.

Still, it may be worth finding out more about it if you are looking for such a system and they are at Thurnell Electronics Ltd. Freepost, Cadishead, Manchester, M30 6DZ. In the meanwhile I'll get a reviewer to give it a good try out and report in the next issue.

Addresses

Addresses

A

Advanced Digital Systems, 9 Bonchurch Road, Portsmouth, Hants. SO5 8LA
AGF Hardware, 26 Van Gogh Place, Bognor Regis, West Sussex PO22 9BY
Addpac Electronics, 22 Watling Street East, Towcester, Northants NN12 7AF
Adaptors and Eliminators, 14 Thames Street, Louth, Lincs.
Autoram, P.O. Box 147, Jeddah, Saudi Arabia
Atari (UK), Atari House, Railway Terrace, Slough, Berks SL2 5BZ
Steven Adams, 1 Leswin Road, London N16 7NL
Audio Computers, 87 Bournemouth Park Road, Southend, Essex.

B

Basicare, 12 Rickett Street, London SW6 1RU
Bi-Pak, P.O. Box 6, Ware, Herts.

C

Camel (Cambridge Microelectronics), 1 Milton Road, Cambridge CB4 1UY
Cobra Technology, 378 Caldeonian Road, London N1 LDY
Computerlock, 2 Wychperry Road, Haywards Heath, West Sussex RH16 1HJ
Computer Keyboards, Glendale Park, Firmbank Road, Ascot, Berks.
Consumer Electronics, Failsworth, Manchester M35 0HS
Colne Electronics, 1 Station Road, Twickenham, Middx TW1 4LL
Computer Cases, 4A Waters Edge, 148 Wellesley Road, Chiswick, London
Currah, Greythorp Industrial Estate, Hartlepool, Cleveland TS25 2DF
Cheetah Marketing, 359 The Strand, London WC2
Compusound, 32 Langley Close, Redditch, Worcs. B98 0ET
Ricky Caplan, 87 Granville Park, Lewisham, London SE13 7DW
E.R. Cameron & Son, H/O 9 The Vineries, Enfield, Middx. EN1 3DQ

D

dk'Tronics, 23 Sussex Road, Gorleston, Great Yarmouth, Norfolk
Dean Electronics, Glendale Park, Fernbank Road, Ascot, Berks. SL5 8JB
Digital Integration, 22 Ash Church Road, Aldershot, Hants GU12 6LX
Delta Research, 15 Church Street, Basingstoke, Hatns. RG21 1QG
Data-assette, 44 Shroton Street, London NW1
DCP Microdevelopment, 2 Station Close, Lingwood, Norwood NR13 4AX

E

E.E.C., Whitehouse Close, Chalfont St Peter, Bucks. SL9 0DA
Euroelectronics, Monteller Street, Retreat, Cheltenham
Electrotech, 2 Heath Close, Winston Hill, Luton, Beds
East London Robotics, Gate 11, Royal Albert Docks, London E16
Elinca Products, Lyon Works, Capel Street, Sheffield, South Yorks
EPROM Services, 3 Wedgewood Drive, Leeds LS8 1EF

F

Fountain Computers, Darvill Road, Ropley, Alresford, Hants.
F.B. Tronics, Unit 2, Park Brook Industrial Estate, Park Street, Lye, Stourbridge, West Midlands DY9 8SS
Filesixty, 25 Chippenham Mews, London W9 2AN
D. Fritsch, 2 Station Road, Thelwall, Cheshire
Peter Furlong, Unit 5S, South Coast Road, Industrial Estate, Peacehaven, East Sussex BN9 8NA
Fuller Micro Systems, 71 Dale Street, Liverpool 2
Fox Electronics, 1412 Abbey Road, Basingstoke, Hants

G

Glanmire Electronics, Westley House, Trinity Avenue, Bush Hill Park, Enfield, Middx. EN1 1PH

H

David Husband, 2 Gorleston Road, Banksome, Poole, Dorset BH12 1NW
Hypnotech, 3 West Vale, Neston, South Wirral L64 9SE
H & K Supplies, 322 Guildford Road, Bisley, Surrey GU24 9AD
Hawnt Electronics, Firswood Road, Birmingham B33 0TQ
Hilderbay, 8/10 Parkway, London NW1 7AA

I

Indescomp. P. Castellana, 179, I. Madrid 16 (phone 010 34 279 31 05)

J

JRS Software, 19 Wayside Avenue, Worthing SO24 0BW

K

Kalenia Wood Products, 4/6 Auckland Street, Burslem, Stoke-on-Trent ST6 2AX
Kelwood Computer Cases, Downs Row, Moorgate, Rotherham, South Yorks. S60 2HD
Kempston Micro Electronics, Unit 30, Singer Way, Woburn Road Industrial Estate, Kempston, Bedford MK42 7AF

M

Micro Z, P.O. Box 83, Exeter, Devon EX4 7AF
Memotech, Station Lane, Witney, Oxon OX8 6BX
Microtext UK, Highland House, 18-24 John Street, Luton, Beds. LU1 2JE
Morex Peripherals, 2 Balliol Road, Caversham, Reading, Berks.
MacQuillan Electronics, 72 Mere Road, Wigston Magna, Leics. LE8 1RL
Micro Aids, Distribution Centre, Beech House, Hob Hey Lane, Culcheth, Warrington, Cheshire WA3 4LN
Micro Power, 8/8A Regent Street, Chapel Allerton, Leeds LS7 4PE
Micronet 800, Scriptor Court, 155 Farringdon Road, London EC1R 3AD
Memotech, Station Lane, Witney, Oxon OX8 6DX
Midwich Computer Co, Rickinghall House, Rickinghall, Suffolk IP22 1HH

O

Orme Electronics, 2 Barriper Road, Cambourne, Cornwall TR14 7QN

P

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PR Electronics, 124 Bretby Close, Doncaster, South Yorks DN4 6EL
Possum Controls, Middlegreen Road, Langley, Slough, Berks SL3 6DF
PH Scientific Products, 9 Southfield, Welwyn Garden City, Herts.
PSS, 452 Stoney Stanton Road, Coventry CV6 5DG
Petron Electronics, Courtlands Road, Newton Abbot, Devon TQ12 2JA

R

RD Labs, 20 Court Road Estate, Cwmbran, Gwent
Ram Electronics, 106 Fleet Road, Fleet, Hants GU13 8PA

S

William Stuart Systems, Quarley Down House, Cholderton, Salisbury, Wilts SP4 0D2
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Steatite Insulations, Hagley House, Hagley Road, Birmingham B16 8QW
Softest, 10 Richmond Lane, Romsey, Hants. SO5 8LA
Softeach, 25 College Road, Reading, Berks. RG6 1QE
Success Services, 154 High Street, Bloxwich, Walsall, West Midlands WS13 3JT
Stonechip Electronics, Unit 9, Brook Trading Estate, Deadbrook Lane, Aldershot, Hants. GU12 4XB
Sinclair Research, Stanhope Road, Camberley, Surrey GU15 3PS
Spirit Instruments, Heybridge, Maldon, Essex.

T

Timedata, 16 Hemmels, Laindon, Essex SS15 6ED
Tactile, Wraith, 32 Emfield, Kingswood, Bristol BS15 2SS
Traffic Technology, PO Box 2, Warminster, Wilts. BA12 7QX
Treetop Designs, 61 Widmore Road, Bromley, Kent
Technology Research, 57 Brockley Rise, London SE23

U

U-Microcomputers, Winstanley Industrial Estate, Long Lane, Warrington, Cheshire WA2 8PR

V

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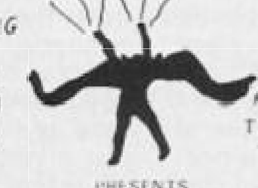
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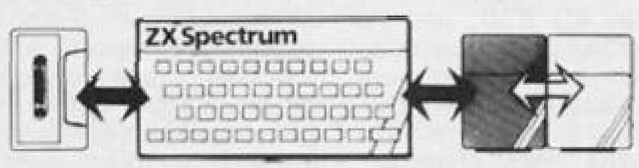
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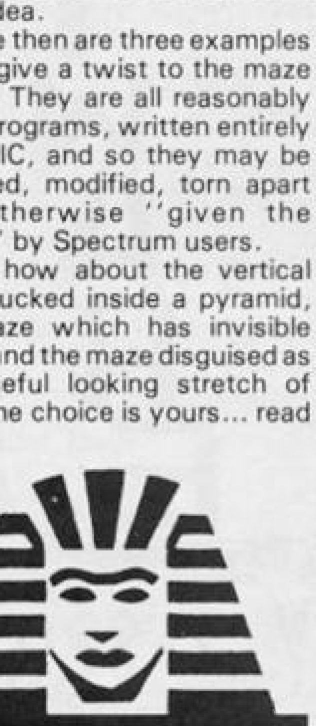
Amazing games

Richard Sargent gives us a few tips on how to puzzle and confuse, Wantage will never be the same!

Maze-type games are probably among the easiest of arcade games to write in BASIC and they are often the starting point in the programming career of many a Spectrum owner. However, no-one wants to play yet another version of PAC-MAN, so the art of construction is not so much in the code itself, but in giving the game some type of variation on the standard maze idea.

Here then are three examples which give a twist to the maze theme. They are all reasonably short programs, written entirely in BASIC, and so they may be analysed, modified, torn apart and otherwise "given the works" by Spectrum users.

So, how about the vertical maze tucked inside a pyramid, the maze which has invisible walls, and the maze disguised as a peaceful looking stretch of sea? The choice is yours... read on.



Maze One: Pharoah's Tomb

The great Pyramid of Cheops was built in Lower Egypt by the Pharoah Khufu at around 2600 BC during the time of the IV Dynasty of the Egyptian Kingdom. As far as is known the Great Pyramid was first re-entered by one Abdullah Al Mamum in AD 820, and he found the King's Chamber to be undisturbed yet lacking its most important possession: the mummy of the pharoah Khufu himself. The main chamber, ante chamber and galleries were reported to be completely devoid of mummies, skeletons or any human remains whatsoever.

Such is the mystery of the Tomb of King Cheops and there must be many a good computer game that can be modelled on a scenario based around the events of 2600 BC. While Egyptologists argue over the case of the missing mummy, you might like to try this program which should not be expected to throw any light on the subject whatsoever!

The screen is laid out to represent some of the pyramid's two and a half million limestone blocks and has an entrance, the King's Chamber (Tomb), the astronomical observation shaft and numerous galleries. You, the player, are a disloyal pall-bearer who wishes to flee the pyramid before the stonemasons (the computer) blcok the galleries with sand. A race against time. A simple display showing how many yards of gallery have been blocked by sand records of your progress as you flee. The game ends either when you have escaped (boo) or when all the galleries have been blocked (hurray). Egyptian ball-bearers were supposed to stay with their mummified King. As far as the program is concerned the odds are in favour of the player, so if you find yourself entombed, blame your slow reaction time! Your movement is by keys 5,6,7,8, the cursor keys.

The screen is drawn up using simple methods. PRINT ATing low resolution blocks puts in the main colour (lines 913, 930, 1000). Next the pyramids go in using ever-shortening horizontal lines (line 8000) and the sun is of course a series of concentric circles (line 951). The pyramid galleries are plotted by reference to their row-column co-ordinates held in DATA lines 7001-7004. These co-ordinates, together with the co-ordinates of the stonemason's intended course are worked out on graph paper before the program is written, and far from being a chore, this is quite fun to do. You can have any number of maze-shapes within your pyramid simply by writing new DATA lines and MERGING them onto the main program.

The stonemason is mapped onto the screen by code at line 2020, his intended path being read from line 7001. He is slowed down in two ways, and you may wish to change the code to speed him up a bit. A straightforward PAUSE in line 2060 checks his speed and the decision in line 2017 determines whether he should move at all on the current pass of the program loop.

The pall-bearer is moved by decoding the keyboard (lines 2045, 2104-2108) and PRINT ATing by line 2204. A quick look-ahead to the intended new position establishes whether it is a valid space with ATTR code 63 or an invalid wall with ATTR code 57. (Line 2202).

Happy pall-bearing!

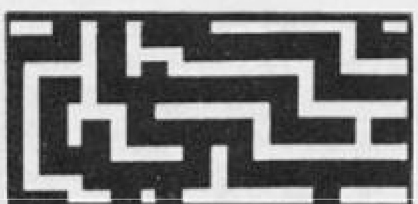
```
890 POKE 23561,255: REM hold down time
891 POKE 23562,255: REM repeat time
899 LET u=2: LET v=0: REM speed advantage for player
900 BORDER 7: PAPER 7: CLS : PRINT AT 17,0; INK 0;"PHAROAH'S TOMB"
901 PRINT AT 18,0; INK 0;"Choose a number 1 - 9"
902 PRINT AT 19,0; INK 0;"The low numbers give high speeds"
903 PAUSE 0: LET k$=INKEY$
904 IF CODE (k$)<49 OR CODE (k$)>57 THEN GO TO 903
910 LET f=(((CODE (k$))-48)*10)9
911 PRINT AT 21,0; INK 0;"Please wait"
913 REM Draw sky
914 FOR r=0 TO 8
916 FOR c=0 TO 31
918 PRINT AT r,c; PAPER 5;" "
920 NEXT c: NEXT r
930 REM draw sand
932 FOR r=9 TO 15
934 FOR c=0 TO 31
936 PRINT AT r,c; PAPER 6;" "
938 NEXT c
940 NEXT r
950 REM draw sun
951 FOR r=1 TO 12
952 INK 6: CIRCLE 216,153,r
953 NEXT r
954 INK 0
984 REM Set up usr chars
985 FOR m=144 TO 146
986 FOR n=0 TO 7
```

```
 987 READ r: POKE USR CHR$ (m)+n
,r
 988 NEXT n
 989 NEXT m
 990 RESTORE 7001
1000 REM draw pyramid
1004 FOR r=20 TO 16 STEP -1
1005 FOR c=0 TO 31
1006 PRINT AT r,c; INK 0;"■"
1007 NEXT c
1008 NEXT r
1009 LET x=0: LET y=48: LET L=25
5: LET s=176
1010 GO SUB 8000
1011 LET x=0: LET y=96: LET L=32
: LET s=113: GO SUB 8000
1012 LET x=224: LET y=104: LET L
=16: LET s=113: GO SUB 8000
1020 REM draw tomb
1021 PRINT AT 10,15; INK 7;" ";
INK 0;CHR$ 144; INK 7;" "
1022 PRINT AT 11,15; INK 7;" ";
INK 0;CHR$ 145; INK 7;" "
1024 REM
1026 REM plot main gallery
1028 FOR i=1 TO 72
1030 READ r,c
1032 PRINT AT r,c; INK 7;" "
1034 NEXT i
```



```
1035 READ r: REM dummy
1036 REM plot escape gallery
1038 FOR i=1 TO 31
1040 READ r,c
1042 PRINT AT r,c; INK 7;" "
1044 NEXT i
1046 REM cul de sacs
1048 FOR i=1 TO 18
1050 READ r,c: PRINT AT r,c; INK
 7;" "
1052 NEXT i
1054 PRINT AT 11,15;CHR$ 146
1056 PRINT AT 15,31;CHR$ 146
2000 LET a=11: LET b=15: REM man
s co ordinates
2002 PRINT AT 21,0; INK 0;"Galle
ries now blocked =="
2003 PRINT AT 21,29; INK 0;"yds"
2004 LET m=0
2009 RESTORE 7001
2010 READ r,c
2015 RESTORE 7001
2016 BEEP 3,6
2017 LET v=v-1: IF v<=0 THEN  LE
T v=65000
2018 IF v/u-INT (v/u)>0 THEN  GO
 TO 2045
2020 PRINT AT r,c; INK 6;"■"
2021 LET m=m+2
2022 PRINT AT 21,25; INK 0;m
2030 READ r,c
2031 IF r=99 THEN  GO TO 4000
2040 PRINT AT r,c; INK 0;CHR$ 14
6
2045 LET k$=INKEY$
2050 IF k$<>"" THEN  GO TO 2080
2060 PAUSE f
2070 GO TO 2020
2100 LET d=a: LET e=b: REM save
position
2103 IF k$="0" THEN  GO TO 9999
2104 IF k$="5" THEN  LET b=b-1
2105 IF k$="6" THEN  LET a=a+1
2106 IF k$="7" THEN  LET a=a-1
2107 IF k$="8" THEN  LET b=b+1
2108 IF k$<"5" THEN  GO TO 2020
2109 IF k$>"8" THEN  GO TO 2020
2200 REM test for valid move
2202 IF ATTR (a,b)<>63 THEN  GO
TO 2230
2204 PRINT AT d,e; INK 7;" "
2206 PRINT AT a,b; INK 0;CHR$ 14
6
2208 IF a=1 THEN  GO TO 3000: RE
M you've won
2210 GO TO 2017
2230 LET a=d: LET b=e
2242 GO TO 2017
3000 PRINT AT 0,0;"You've won":
```

```
BEEP 3,6: GO TO 9999
4000 PRINT AT 1,14; PAPER 6; INK
 0;CHR$ 146
4002 PRINT AT 0,0;"You've lost":
 BEEP 3,-2: GO TO 9999
7000 DATA 0,0,24,60,126,126,126,
126,126,60,60,60,24,24,24,0,0,24
,126,24,24,36,102,0: REM data fo
r usr chars ---Main traj table f
olows
7001 DATA 15,31,15,30,15,29,15,2
8,15,27,15,26,15,25,16,25,17,25,
18,25,18,24,18,23,18,22,18,21,18
,20,17,20,16,20,16,19,16,18,16,1
7,16,16,16,15,17,15,18,15,19,15,
19,14,19,13,19,12,19,11,19,10,18
,10,17,10,17,11,17,12,17,13,16,1
3,15,13,14,13,13,13,13,14,13,15,
13,16,13,17,13,18,13,19,12,19,11
,19,10,19,9,19,8,19,8,18,8,17,8,
16,8,15,8,14,8,13,8,12,7,12,6,12
,6,13,6,14,6,15,6,16,5,16,5,17,4
,17,3,17,3,16,3,15,3,14,2,14,1,1
4,99
7002 REM escape table
7003 DATA 17,9,17,8,17,7,17,6,17
,5,17,4,16,4,15,4,15,5,15,6,14,6
,13,6,12,6,12,7,12,8,12,9,12,10,
12,11,11,11,11,12,11,13,11,14,11
,20,11,21,11,22,11,23,11,24,11,2
5,12,25,13,25,14,25
7004 REM cul de sac table
7005 DATA 19,25,18,6,19,6,11,8,1
0,8,10,9,9,9,9,10,8,10,10,22,9,2
2,9,21,8,21,7,21,7,20,6,20,6,19,
5,19
7006 REM
7049 GO TO 9999
7050 STOP
8000 PLOT x,y: DRAW 0+L,0
8010 LET x=x+1: LET y=y+1: LET L
=L-2
8030 IF y=s THEN  RETURN
8050 GO TO 8000
9999 PAUSE 0: PAPER 7: CLS : POK
E 23561,35: POKE 23562,5: STOP
```



Maze Two: The Invisible Maze

This design looks like the plan-view of a hedge maze that you often find in the grounds of Stately Homes. The trouble is that by means fair and foul the hedges have been made invisible, and you can only see the entrance and central patio. There is treasure at the centre of the maze and a guardian who patrols the pathways. Naturally, it is your task to steer a *small* person towards the treasure without causing him to be crushed by the wandering guardian. Watch that guardian carefully: you might be able to memorise the twists and turns in the pathways that lead to the treasure.

The player's movements are plotted in a manner similar to that used in PHAROAH'S TOMB but the maze is constructed in a different manner. Lines 515, 518 & 520 PLOT down columns and lines 540 & 550 PLOT across rows: a DATA statement is still used but not every single row/column coordinate is specified. Can you work out how the PLOTS are made?

The guardian follows a set pattern of travel but does not follow row/column coordinates. Instead he proceeds in a straight path and turns right whenever he meets a wall. By a careful design of the maze he is made to follow about 90% of the pathways and never gets trapped in a cul-de-sac.

The games ends when your man reaches the treasure or when he is trampled by the guardian. A record of his moves around the maze tells you how efficiently you are guiding him.

The maze print-out is achieved by pressing C (for cheat) which makes the maze walls visible. Slow coaches like myself can only play the game in this mode anyway!

```
  5 REM THE INVISIBLE MAZE
  10 LET A=6: LET Z=0: LET P=1:
LET M=0
  12 POKE 23561,255: POKE 23562,
255
  50 BORDER 6: PAPER 7: INK 7: C
LS
 102 DATA 0,0,31,2,10,19,2,21,24
,3,5,6,3,24,25,4,16,17,5,3,4,5,9
,14,5,17,18,5,24,25,7,3,4,7,9,11
,7,17,18,7,20,22,7,24,25,8,18,19
,9,4,5,12,16,22,12,24,25,14,10,1
1,14,16,20,14,28,30,16,9,14,16,1
6,20,17,2,4,17,9,14,17,17,19,19,
2,31,13,13,14,11,19,20,14,24,25,
0,0,99
 104 DATA 0,0,19,2,2,5,7,2,11,13
,2,16,5,6,16,2,7,5,16,7,17,12,9,
13,13,10,14,9,11,11,7,18,8,8,19,
9,9,21,11,7,22,11,1,27,5,7,27,10
,16,27,18,1,29,2,4,29,8,10,29,17
,1,31,18,12,4,13,16,23,17,15,24,
16,16,25,17,8,24,9,0,0,99
 106 DATA 2,4,4,4,4,11,4,14,4,19
,4,21,5,20,5,22,7,13,8,9,8,12,9,
19,9,25,10,3,10,9,11,5,12,12,12,
27,14,22,15,4,16,22,2,8,13,3,14,
14,11,25,0,99
 107 DATA 0,24,126,24,24,36,102,
0,255,231,195,195,195,231,195,25
5
 200 PRINT ; INK 0;AT 20,3;"Welc
ome to the invisible maze";AT 21
,3;"Please wait."
 201 LET I=4: LET W=32: GO SUB 5
15
 202 PRINT AT 20,2; INK 4;"■";AT
21,0;"■■■";AT 20,0;"■";AT 20,1;
 INK 0;CHR$ 144
 209 FOR C=144 TO 145
 210 FOR N=0 TO 7: READ R: POKE
USR CHR$ (C)+N,R: NEXT N: NEXT C
 401 PRINT  PAPER 7; INK 2;AT 9,
14;"■";AT 9,16;"■";AT 10,13;"■";
AT 10,16;"■■";AT 11,14;"■";AT 11
```

```
,16;"■"
 402 PRINT AT 10,15; INK 0;CHR$
144: PRINT ;AT 10,14; INK 2;CHR$
 145: LET R1=10: LET C1=15
 406 PRINT ; INK 0;AT 21,3;"Pres
s any key to continue.": PAUSE 0
 408 PRINT AT 20,3; INK 0;"The g
uardian of the treasure ";AT 21,
3;"is about to take exercise.":
PAUSE 100
 410 LET I=4: LET W=32: LET P=1:
 GO SUB 9050
 412 PRINT ; INK 0;AT 20,3;"You
may now attept to rescue";AT 21,
3;"the treasure.  Moves made 0 "
: BEEP 6,3
 413 LET R2=20: LET C2=1: LET P=
1: LET A=6
 414 REM ***********************
 420 GO SUB 900
 421 IF Z=2 THEN  GO TO 480
 422 LET SC=C2: LET SR=R2
 423 LET k$=INKEY$: IF k$="C" OR
 k$="c" THEN  LET I=4: LET W=143
: PRINT ; INK 4;AT 18,14;"■";AT
18,7;"■";AT 5,8;"■": GO SUB 515
 424 IF k$="0" THEN  GO TO 9999
 425 IF k$="5" THEN  LET C2=C2-1
 426 IF k$="6" THEN  LET R2=R2+1
 427 IF k$="7" THEN  LET R2=R2-1
 428 IF k$="8" THEN  LET C2=C2+1
 429 IF k$<"5" OR k$>"8" OR k$="
" THEN  GO TO 420
 430 LET M=M+1: PRINT AT 21,29;
INK 0;M
 431 IF R2=10 AND C2=15 THEN  PR
INT AT 10,15;CHR$ 144;AT 11,15;"
 ": GO TO 460: REM WON
 432 IF R2=7 AND (C2=14 OR C2=15
 OR C2=16) THEN  PRINT AT 8,15;
INK 2;"■"
 433 IF ATTR (R2,C2)=63 THEN  PR
INT AT R2,C2; INK 0;CHR$ 144: PR
INT AT SR,SC;" ": GO TO 420
 434 IF CODE (SCREEN$ (R2,C2))=0
 THEN  GO TO 480: REM LOST
 436 LET C2=SC: LET R2=SR: PRINT
 AT R2,C2; INK 0;CHR$ 144: GO TO
 420
 459 REM WON
 460 PRINT ; INK 0;AT 20,3;"YOU
HAVE GAINED THE TREASURE";AT 21,
3;"Will you try again? Y/N      "
 461 PRINT ; INK 0; FLASH 1;AT R
2,C2;CHR$ 144: PAUSE 200: GO TO
9998
 479 REM LOST
 480 PRINT ; INK 0;AT 20,3;"YOU
HAVE BEEN EATEN !        ";AT 21,
3;"Will you try again? Y/N      "
; FLASH 1;AT R1,C1;CHR$ 144;AT R
2,C2;CHR$ 144: PAUSE 200: PRINT
; FLASH 0; INK 0;AT R2,C2;" ";AT
 R1,C1;CHR$ 144: GO TO 9998
 514 REM MAZE DRAWER
 515 RESTORE 100
 518 READ R,S,F: IF F=99 THEN  G
O TO 540
 520 FOR C=S TO F: PRINT AT R,C;
 INK I;CHR$ W: NEXT C: GO TO 518
 540 READ S,C,F: IF F=99 THEN  G
O TO 560
 550 FOR R=S TO F: PRINT AT R,C;
 INK I;CHR$ W: NEXT R: GO TO 540
 560 READ R,C: IF C=99 THEN  RET
URN
 565 PRINT AT R,C; INK I;CHR$ W:
 GO TO 560
 600 REM
 899 GO TO 8000
 900 REM MOVE ROBOT
 907 LET SR=R1: LET SC=C1
 910 IF A=0 THEN  LET R1=R1-1
 911 IF A=3 THEN  LET C1=C1+1
 912 IF A=6 THEN  LET R1=R1+1
 913 IF A=9 THEN  LET C1=C1-1
 915 IF ATTR (R1,C1)=63 THEN  PR
INT AT SR,SC;" ";AT R1,C1; INK 0
;CHR$ 144: PAUSE P: RETURN
 917 IF CODE (SCREEN$ (R1,C1))=0
 THEN  LET Z=2: PRINT AT SR,SC;"
 ": RETURN
 918 LET C1=SC: LET R1=SR
 920 IF A=9 THEN  LET A=0: GO TO
 907
 922 LET A=A+3: GO TO 907
2400 LET I=0: LET W=32: GO SUB 5
15
7432 IF R2=10 AND C2=15 THEN  PR
INT AT 10,15; INK 0;CHR$ 144: GO
 TO 460: REM WON
8999 GO TO 9999
9050 FOR N=1 TO 18: GO SUB 900
9052 NEXT N: PRINT AT 18,7; INK
I;CHR$ W
9054 FOR N=1 TO 95: GO SUB 900
9056 NEXT N: PRINT AT 5,8; INK I
;CHR$ W;AT 18,14;CHR$ W
9057 FOR N=1 TO 97: GO SUB 900
9058 NEXT N
9062 PRINT AT 10,15; INK 0;CHR$
144
9064 RETURN
9998 PAUSE 0: IF INKEY$="Y" OR I
NKEY$="y" THEN  RESTORE 100: GO
TO 1
9999 POKE 23561,35: POKE 23562,5
: BORDER 7: PAPER 7: INK 0: CLS
```



Maze three: Yacht Race

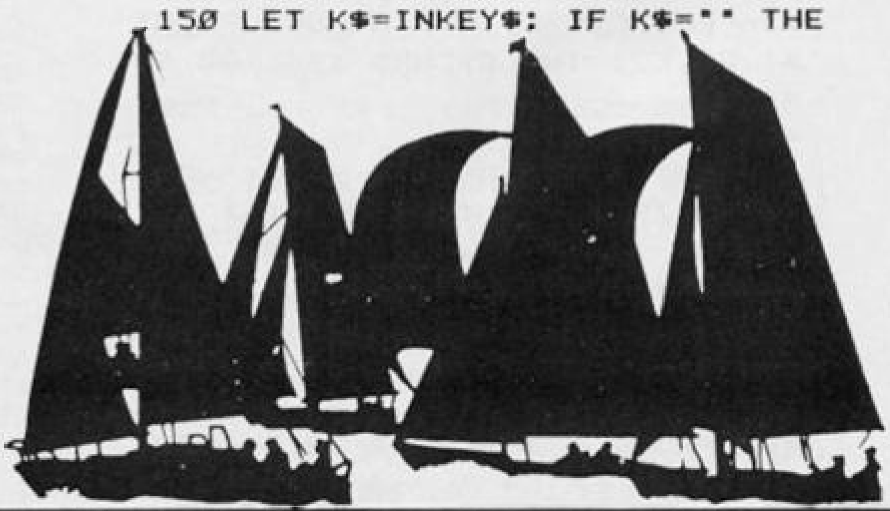
In this final variation of the maze theme the "walls" are represented by wave-patterns and buoys and to change them causes your yacht to sink! The object of the game is to sail your yacht around the watery screen and berth it in the harbour before the computer's yacht manages to do likewise. There are a few small problems — the computer's yacht never hits a wave or a buoy (well it wouldn't would it?), and there are two other yachts in the vicinity which are liable to get in your way. It is a simple race against time and there is no need for scoring.

Player movement is by the usual cursor control keys 7,6,8,5 representing North, South, East and West and in addition keys 1,2,3 & 4 are available for NE, NW, SE, SW.

The maze of waves is generated randomly in this program (line 12) so the sea is a little different for every game you play and it is within the bounds of possibility that your yacht will be completely surrounded by waves. If that is the case you must conceed that game! The computer's yacht follows a set path in the same manner as the stonemason from PHAROAHS TOMB, and the reason why the yacht always avoids obstacles is that any random waves in the pathway are quickly removed at the start of the game. Now that's what I call cheating!

A few changes can easily be made to this type of game. For example, a wake can be plotted behind the computer's yacht (just as sand was plotted behind the stonemason) and the course (DATA line 99) altered so that the yacht and its wake tries to head-off the player's yacht. Alternately the computer's yacht could be replaced by a second player's yacht... and so on. Maze games are fun and can be a good way of practicing your BASIC.

```
   1 REM YACHT RACE  144=WAVES
     145=YACHT  146=BOUY
   2 LET P=1: POKE 23561,255: PO
KE 23562,255
   3 BORDER 4: PAPER 1: INK Ø: C
LS
   5 FOR C=144 TO 146
   6 FOR N=Ø TO 7: READ R: POKE
USR CHR$ (C)+N,R: NEXT N: NEXT C
   8 FOR N=1 TO 7Ø
   9 PRINT AT 1+INT (RND*2Ø),1+I
NT (RND*3Ø); INK 7;CHR$ 144;CHR$
 144: NEXT N
  1Ø LET R2=19: LET C2=29: LET R
3=2: LET C3=2: LET R4=19: LET C4
=2
  11 FOR N=1 TO 1Ø
  12 PRINT AT 1+INT (RND*2Ø),1+I
NT (RND*3Ø); INK 7;CHR$ 146: NEX
T N
  13 LET U=1Ø: LET V=2ØØØ
  14 READ R,C: IF C<99 THEN  PRI
NT AT R,C;" ": GO TO 14
  16 READ R,C: IF C<99 THEN  PRI
NT AT R,C; INK 7;CHR$ 144: GO TO
 16
  38 PRINT AT 2,29; INK 6;CHR$ 1
45: PRINT AT R2,C2; INK 5;CHR$ 1
45; INK 7;AT R3,C3;CHR$ 145;AT R
4,C4;CHR$ 145
  4Ø FOR C=Ø TO 31
  41 PRINT  INK 4;AT Ø,C;"■";AT
21,C;"■": NEXT C
  42 FOR R=1 TO 2Ø
  43 PRINT  INK 4;AT R,Ø;"■";AT
R,31;"■": NEXT R
  44 PRINT ; INK 2;AT 8,Ø;"▛▀▀▜"
;AT 9,Ø;"■";AT 1Ø,Ø;"■  ▌";AT 11
,Ø;"▛▀▀▜";AT 12,Ø;"■";AT 13,Ø;"■
  ▌";AT 14,Ø;"▀▀▀▀"; INK Ø;AT 9,
2;"  ";AT 12,2;"  "; INK 6;AT
9,1;CHR$ 146;AT 12,1;CHR$ 146
  46 PRINT ; PAPER 4;AT Ø,1Ø;"YA
CHT  RACE";AT 21,9;"GET SET ---
";: BEEP 3,8: PRINT ; PAPER 4; F
LASH 1;"GO"
  95 DATA Ø,28,34,193,Ø,Ø,Ø,Ø,16
,24,28,3Ø,31,16,255,126,56,16,16
,16,56,124,125,146
  99 DATA 3,28,4,27,5,26,5,25,6,
24,7,23,7,22,8,21,7,2Ø,6,19,7,18
,6,17,6,16,7,15,8,14,7,13,8,12,9
,11,9,1Ø,1Ø,9,1Ø,8,11,7,1Ø,6,1Ø,
5,9,4,9,3,9,2,99,99
 1ØØ DATA 9,21,9,2Ø,8,18,8,17,8,
13,9,13,9,9,9,8,9,7,99,99
 11Ø RESTORE 99
 111 LET R=2: LET C=29
 12Ø LET V=V-1: IF V<=Ø THEN  LE
T V=2ØØØ
 121 IF V/U-INT (V/U)>Ø THEN  GO
 TO 127
 122 PRINT AT R,C; INK 7;"-": RE
AD R,C: IF R=99 THEN  GO TO 26Ø:
 REM COMP WINS
 123 IF ATTR (R,C)=13 THEN  LET
Y=R: LET X=C: GO TO 23Ø
 124 PRINT AT R,C; INK 6;CHR$ 14
5
 127 LET Y=R3: LET X=C3: GO SUB
5ØØØ: REM MOVE RANDOM YACHT1
 128 LET R3=Y: LET C3=X
 135 LET Y=R4: LET X=C4: GO SUB
5ØØØ: REM MOVE RANDOM YACHT2
 14Ø LET R4=Y: LET C4=X
 15Ø LET K$=INKEY$: IF K$="" THE
```



```
N  PAUSE P: GO TO 12Ø
 16Ø IF k$="Ø" THEN  GO TO 9999
 17Ø IF k$<"1" OR k$>"8" OR k$="
" THEN  GO TO 12Ø
 18Ø LET N=VAL K$: LET X=C2: LET
 Y=R2: LET SR=R2: LET SC=C2: GO
SUB 6ØØØ
 19Ø IF X=1 AND (Y=9 OR Y=12) TH
EN  GO TO 275: REM WON
 2ØØ IF ATTR (Y,X)=8 THEN  PRINT
 AT Y,X; INK 5;CHR$ 145: PRINT A
T SR,SC; INK Ø;" ": LET R2=Y: LE
T C2=X: GO TO 12Ø
 21Ø PRINT AT SR,SC;" "
 23Ø PRINT AT Y,X; FLASH 1; INK
7;"*": BEEP 3,5
 26Ø PRINT ; PAPER 4;AT 21,1;"YO
U'VE LOST. ";AT 9,2; PAPER 1; IN
K 6;CHR$ 145
 27Ø PRINT ; PAPER 4;AT 21,14;"A
nother try? Y/N": GO TO 9998
 275 PRINT ; PAPER 4;AT 21,1;"YO
U'VE WON.  ": GO TO 27Ø
 426 REM
 427 REM
 428 REM
 6ØØ REM
4999 REM MOVE RANDOM YACHT
5ØØØ LET SR=Y: LET SC=X: LET N=1
+INT (RND*8): GO SUB 6ØØØ
5ØØ2 IF ATTR (Y,X)=8 THEN  PRINT
 AT Y,X; INK 7;CHR$ 145: PRINT A
T SR,SC; INK Ø;" ": RETURN
5ØØ3 IF ATTR (Y,X)=13 THEN  GO T
O 23Ø
5ØØ4 LET X=SC: LET Y=SR: RETURN
6ØØØ REM ADJUST COORDINATES
6ØØ1 IF N=4 THEN  LET Y=Y-1: LET
 X=X+1
6ØØ3 IF N=2 THEN  LET Y=Y+1: LET
 X=X+1
6ØØ4 IF N=1 THEN  LET Y=Y+1: LET
 X=X-1
6ØØ5 IF N=3 THEN  LET Y=Y-1: LET
 X=X-1
6ØØ6 IF N=5 THEN  LET X=X-1
6ØØ7 IF N=6 THEN  LET Y=Y+1
6ØØ8 IF N=8 THEN  LET X=X+1
6ØØ9 IF N=7 THEN  LET Y=Y-1
6Ø1Ø RETURN
9998 PAUSE 1: PAUSE Ø: IF INKEY$
="y" OR INKEY$="Y" THEN  RESTORE
 95: GO TO 1
9999 POKE 23561,35: POKE 23562,5
: PAUSE Ø: BORDER 7: PAPER 7: IN
K Ø: CLS
```

Readers' Reviews



Taking pen in hand, you tell us what the public really think about the goods on sale.

Pheenix
Megadodo Software
Mark Sargusingh

Pheenix for the 16 or 48K Spectrum, is a reproduction of the arcade favourite Phoenix.

Pheenix is a space invader type of game in which you must destroy the aliens to enter the next phase of the game. You control yours spaceship which is equipped with left, right, fire and barrier controls.

The barrier protects your ship from oncoming blasts of alien fire. Like the arcade game, your barrier only protects yours ship for 3 seconds, you must then wait a further 3 seconds before using your barrier again.

I found the barrier most useful in the first and last phases of the game.

In each phase you will have to destroy:

PHASE 1 Purple birds worth 25 points
PHASE 2 Green birds worth 25 points
PHASE 3 Large blue birds worth 100 to 250 points
PHASE 4 Large purple birds worth 100 to 250 points
PHASE 5 Alien spaceship worth 4000 to 6000.

You are awarded 100 points on phases 4 and 3 if you destroy a bird while it is still an egg, but you gain 150 to 250 points if you destroy it after it has hatched. At 10,000 points you gain a life and if you clear all 5 phases, the game returns to the beginning.

The graphics were very good and similar to the arcade version and were moving smoothly across the screen. Sound was also good but not enough sound was given when your ship was destroyed.

Pheenix is written in Machine Code and costs $5.50 from Megadodo Software. It is undoubtedly the best Phoenix game available for the ZX Spectrum.

Chuckie Egg
A & F Software Ltd.
Neil Wheatley

Since Chuckie Egg's release, at the time that Manic Miner was topping the software charts it has been a firm contender for my favourite game. It has a very colourful and informative cassette insert, (with instructions and a brief description of game play.)

Once loaded via LOAD"", ideal for a newcomer to the intricacies of the Spectrum keywords and all those shifts, you are presented with a high score table and instructions on which keys to press moving along the bottom of screen, a la Manic Miner. This tells you to press "R" for redefining the control keys, "I" for instructions and "S" to start.

If "R" is pressed, then you are presented with three options; define your own keys; use cursor keys; or use another set of five keys. This helpful option allows use of all joysticks, other software houses please note. .

If "I" is pressed then the instructions are printed onto the screen explaining that you, playing the part of little 'o' farmer boy', must collect a dozen eggs on each screen and doing so will take you onto the next screen. This may sound easy but there a number of killer chickens on the screen that will kill you if they touch you. Also there is a bonus that ticks away until it reaches zero, meaning death for you.

Pressing "S" takes you into the game, there are five keys used for left,right,up,down and jump. Two keys are pre-set SHIFT A for abort, which takes you back to the high score table and SHIFT H for halt which temporarily suspends actions.

The only quibble I have is that having selected a multi-player option, up to four people can play-action switching from one player to another on losing a life, the high score table is only updated at the very end of the game — all lives having been lost, meaning that players have to remember which player number they were.

The graphics are superb and the animation of your figure is very cartoonish. This if it had been bought out before Manic Miner could easily have been number 1, so it's trumps to A & F for a superb piece of software.

GEOGRAPHY 1
ICL
Jim Lock

Early entrants to the Spectrum educational software scene were ICL with a series of programs entitled Fun to Learn. With the notable exception of Geography 1, the series was very disappointing. I was struck then by Geography 1 and it still stands out as one of the very few worthwhile educational packages for the smaller Spectrum.

The cassette is attractively presented with a colourful inlay card giving clear loading instructions but very little information as to the program contents. It does, however, contain a useful warning to start the program with GO TO 1 and points out the unfortunate effect of using RUN.

Two separate programs are recorded on one side of the cassette, Towns in England and Wales and Countries and Capitals of Europe. Loading a program produces a screen of well laid out instructions on how to play and the types of question used. Up to 4 players can take pat in what is best described as an educational race. Each player is asked, in turn, to enter their name and then choose a colour. With the preliminaries sorted out, the program begins.

In the first program, a map of England and Wales is printed on the screen in yellow and blue, using low resolution graphics. The screen also shows a vertical row of dots for each player, in that player's chosen colour. These rows are the score lines — correct answers being rewarded by the substitution of two coloured blocks for dots in the player's row. The player whose line reaches the top of the screen first is the winner.

The name of the first player is shown, followed by the first question. There are two types of question in the program — with one, a cross is printed on the map and a numbered list of towns shown. You choose the town on the list which you think is situated at the site of the cross and press the corresponding number key. The second type of question shows the name of one town only and prints several numbered crosses on the map. You decide which cross is closest to the location of the given town and press the number key as before.

Players are asked questions in turn, until one succeeds in reaching the top with his score line. A flashing "Victory" message is then displayed, followed by a "new game or quit" option.

The programs have been well devised and are genuinely challenging. The questions can vary considerably in difficulty (who was it who once said, "A difficult question is the one to which you don't know the answer"?). Occasionally, the program's random selection of names to fill the menu can result in a really awkward question. I ▶

was once faced with having to decide whether a cross on the West Coast of England was over Blackpool or Southport. . . and I was wrong! The cassette could easily be retitled "So you think you know about Geography?" as it closely resembles that type of quiz with deceptively simple looking questions requiring absolutely accurate answers. Your ego may show a few bruises after each game, but you will be pleasantly surrsed at the amount of knowledge gained.

The inclusion of a competitive "race" element is an excellent idea, adding greatly to the enjoyment of the game. You might think that it would be difficult for a whole family to compete fairly, due to differences in ability, and up to a point you would be right — but not for the obvious reason. Our two daughters regularly beat my wife and I hollow! Part, if not all, of the reason for this is their invention and implementation of a grossly unfair handicapping system — the girls use an Atlas!

The maps are fairly accurate, which is important with this type of program, but being composed of graphics blocks, have a somewhat crude appearance. This is far more noticeable on the map of Europe, the scale and chunky graphics giving some very odd-looking results — Great Britain, for example. This is more of an idiosyncrasy of the program than a genuine cause for criticism, though. Considering the limited amount of memory available on the 16K machine, the programmers have done as good a job as is humanly (and Spectrumly) possible.

Educationally, these programs are excellent, being informative without being boring, and succeed in imparting a great deal of geographical knowledge without the recipient being aware of any learning process going on at all.

Software producers have tended to overlook the subject of geography,preferring instead to concentrate on relatively easy to produce programs for teaching maths and languages. The neglect is regrettable and in one respect, astronishing — can you think of a better use for a sophisticated computer than drawing beatiful maps?

Come on, ICL, where is Geography 2???

The Birds and the Bees
Bug-Byte Software
Peter Craven

Although insects often prove to be very annoying — the insect star of the new game quickly changed my mind (although he tends to be frustrating at times). You play the part of Boris the Bee — one of the busiest bees yet. Upon loading the game, the title screen (accompanied by the music of The Flight Of The Bumble Bee) appears. Pressing a key again launches you into the game — the object of which is to do what a bee does best — collect nectar and then take it back to your hive. Of course it is not easy — there are various hazards such a viciously swooping blackbirds, wasps and Venus fly-traps to hinder any progress — not exactly my idea of helpful neighbours.



Naturally you will need warning to help you avoid these pesky creatures — so a radar is present at the bottom of the screen showing your's and the hazard's positions. There are relatively few controls to master — four direction keys and, for emergencies, pressing any key from B to Space releases any nectar Boris is carrying to enable him to make a quick getaway. (The program also caters for most popular makes of joystick interface — Kempston etc.) Pressing the left or right key and holding it down makes Boris accelerate making it harder to swerve.Also the more nectar you are carrying the slower you fly — easy prey for birds.

The graphics are excellent (done by Matthew Smith of Manic Miner fame) and are well though out — a bright yellow sun shining, clouds drifting past slowly, flowers opening when Boris lands on themand there is even a small plane flying the Buy-Byte logo. You the bee, are a cute little bit of graphics design — antennae waving with legs and wings mving convincingly. Motion is smooth while sound effects are negligible — but how much sound do you need — certainly no zaps and pows. There is also a speech option if you have a Currah micro speech module attached to your Spectrum. Although this game is not quite as good as Manic MIner (my favourite game) it is highly recommended at $5.95. An excellent, original game — bound to Bee another sweet success for Buy-Byte.

Lords Of Midnight
Beyond Software
Stephen Komer

This game is, as the ad's say, more than an adventure. It comes in a colourful but rather flimsy package, and is supplied with a thin plastic overlay and a book which, besides containing the instructions, outlines the events leading up to the beginning of the game. This story, although only a few pages long, makes fascinating reading and sets the scene nicely.

The game begins on the day of the Winter Solstice. Doomdark, Witchking of Midnight (played by the computer) is moving his vast hordes out of their strongholds in the North in a bid to subdue the armies of the Free. You take the part of Luxor the Moonprince, and three of his most loyal allies. You move only by day, and the distance a character may move in one day depends on his strength, the terrain, and whether he is on foot or horseback. When all your moves have been made, pressing NIGHT signals the start of activities for Doomdark's forces.

To win the game, you must achieve at least one of two objectives:

Seize the Citadel of Ushgarak, the Witchking's headquarters — this is a war strategy game; *or*

Destroy the Ice-Crown in the Tower of Doom. Only Morkin is protected against its terrible powers, but other characters you may come across will also be able to undertake this hazardous quest.

Doomdark must achieve two objectives to win:

He must eliminate Morkin, Luxor's son;

He must subdue the armies of the Free, either by killing Luxor, or by taking the Citadel of Xajorkith.

Unlike other adventure games, only four commands are used to control your characters. You must move through the land of the Free, looking for Lords who will support you, as you have no armies of your own. A rudimentary map gives you some idea of the locations of the main Citadels where help may be sought. There are, naturally, many lesser Citadels, Keeps and other locations where you may also find help, but these are not on the map.

It is the unique 'Landscaping' feature of this game which sets it apart from any other. Standing at any location, you can look in eight directions and see a different view in each direction. As you get nearer to a building or other object, its size increases until it almost fills the screen. The programmers claim to have provided 32,000 different views, each one different.

To sum up, this really is an epic game not to be missed by any adventurer, wargamer, or fantasy fan. At a price of £9.95, it represents excellent value-for-money.

The Complete Spectrum ROM Disassembly
Melbourne House

CTC Gibson

For those of you interested in acquainting yourself with the joys of Spectrum machine code, then, before I go any further, may I highly recommend both of these books.

The first of these two titles, Spectrum Machine Language, takes the would-be programmer right from the fundamentals of machine code, through to some of the refinements of the computer's native language. The reader is not dropped in at the deep end from the very start, but is led in gently with clear explanations but this is where one of my few criticisms comes in: at the beginning, in an attempt to interest the reader, the author tries to joke, and in some places he succeeds in his aim of putting the reader at ease, but after a while, some people might find Tang's humour slightly patronising; I suppose this does however, depend on whether you have a similar sense of humour or not.

The book deals with most aspects of machine code, with the advantage (to Spectrum owners anyway), of dealing specifically with one computer, and is therefore able to go into some detail when dealing with sound and the display. Indeed, at the end, there is 'an exciting, original arcade game'

— the publisher's immortal prose, not mine — fully explained in six stages in the preceeding pages, and although not very original, as it appears to be yet another version of 'Frogger', it forms an important part of the book, because it shows how your newly-aquired knowledge can be brought together to create a machine code program.

As I said, it deals with most aspects, but contains only a few paragraphs on some Z80 instructions, eg those dealing with interrupts and restarts (RST), probably because the book is only meant as an introduction, but if this is the case, then why did the author simply leave these sections out? B.C.D. (binary coded decimal) arithmetic, I found, was not very clearly explained, the only area where this criticism is justified.

After I had read through most of the book, I sometimes found it frustratingly difficult to look up a certain subject, mainly due to the very poor index — a feature sadly very common in micro books — and also the fact that each instruction was usually quite slowly introduced — a good idea when learning, but it means a lot of searching when referring back to check up on something not clearly understood. Included in the book are eight useful appendices and two uninspired monitor programs written in BASIC; perhaps a useful inclusion would have been a summary of the functions of each instruction and the effect on the flags, which would have been handy for reference.

Spectrum Machine Langauge For The Absolute Beginner Melbourne House

As the 'blurb' on the cover says, the 'Complete Spectrum ROM Disassembly' is indeed a 'must for all serious programmers', but also a tempting treat foir the average home user. It is what the title says; the whole listing in assembly language of the machine code control program in ROM which makes the Spectrum act as it does. The initial reaction is that this seems to be an interesting book, but one which does not really serve any useful purpose, a supposition which is totally wrong. All the routines are very fully and clearly explained by the authors, and when their comments are read, the reason a particular instruction was used and what part it plays in the routine should be clear to anyone with some knowledge of assembler.

While it is not meant to be read from cover to cover like a novel, it does help the programmer to incorporate some of the ROM's routines in their own masterpieces, and hopefully learn from the techniques employed. For example, rather than waste memory by writing a 'CLS' routine, a quick delve into the book reveals that this routine resides at 0D6B (hex) and so can be CALLed.

The restart routines, very often not dealt with by other machine code books although some are very useful, are of course explained in detail, as, in particular, are the arithmetic routines, which are handled exceptionally clearly and concisely with several example BASIC programs.

The book is split into 10 logical sections, each handling one particular area of the ROM, eg. the loudspeaker routines and the screen and printer handling routines, all of which are preceeded by a short introduction before the actual disassembly begins. A complete list of the titles of all the routines is given at the back of the book.

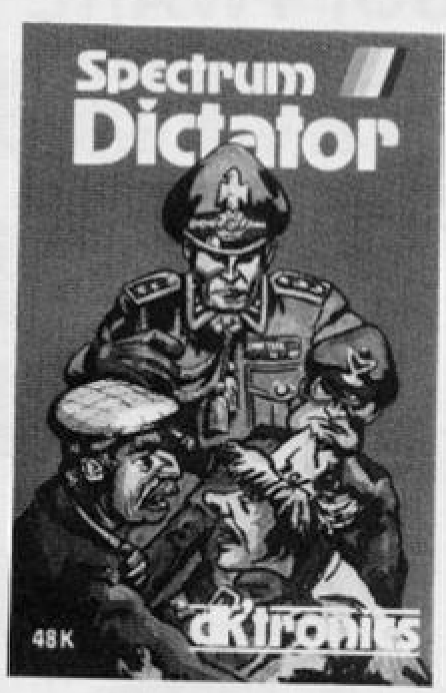
At £9.95, it is expensive, but if you have the money, it is well worth buying.

To sum up, bought together, these two books form a formidable combination, as once you have mastered most of machine code, with 'Spectrum Machine Language', the ROM disassembly should enhance your programming techniques and programs. However, bought separately, they seem to be the best of their kind in their particular field. Very highly recommended.

Dictator DK'Tronics Edward Davey

Dictator is a simulation game which places you as the dictator of Ritimba, a small banana republic in Africa. Sharing all your border is Leftoto, an even smaller country with slightly hostile inhabitants. According to the instructions to the game, which are in tiny print on two sides of the cassette insert, this country will never invade Ritimba, but this is not so.

Your population is divided into three factions — the army, landowners and peasants. Their interests nearly always oppose each other's, except in the matter of deposing the secret police. The secret police are another group which are supposed to



protect you from assassination. The other groups include the guerillas, based in Leftoto, who are well and truly out to get you, and the two Superpowers, Russia and America, from whom money can be borrowed.

The object of the game is to stay alive and popular for as long as possible, (your rule is measured in months), while siphoning as much money as possible from the state treasury into you Swiss bank account. Your final score takes into account your final popularity, length of rule and money in your Swiss bank account, (only if you are still alive at the end of the game).

Every month, one of the three factions will make a request to improve, or otherwise, the country. Granting this request will usually mean addition to or subtraction from the treasury (you start off with $100,000) and will alter your popularity with various factions, and their strengths.

By paying $100,000, the secret police will give you a report of your popularity with all the groups, and their strength's. They will also warn of an assassination attempt or revolution. An assassination attempt can be mounted by army, peasants or landowners, and if one occurs, your safety depends on the strength of the secret police.

A revolution occurs when your popularity is very low with one or more factions, if their strength is at a reasonable level. In this case, you can either stay and fight the revolution, banding with a loyal faction, or make an escape attempt, either on foot or in a helicopter (you have the opportunity of buying one during the game). If you reach Leftoto, you will find refuge there. However, occasionally the helicopter does not start, and you have to travel on foot, which gives the guerillas a chance of catching and killing you. If you stay behind and fight, you will be killed if the combined strength of the revolutionaries exceeds yours and your ally's. Otherwise you will win. (Your strength can be built up during your rule, but at a considerable cost in dollars.)

During your rule, the treasury will become depleted due to monthly costs of running the country and various extra payments. The only way to replenish it to any major extent is to any major extent is to borrow from the two Superpowers. You can do this once, and the amount you are given depends on your popularity with them. Once the treasury is bankrupt, your popularity and strength will decrease, and you will receive no more secret police reports. After a while in this condition, you will either be assassinated or a revolution will occur.

Due to the limited amount of money available, it is impossible for your to last indefinately — a survival time of three years is extremely good.

At £4.95, Dictator is a very good buy, with its attractive graphically-decorated text and superb sound effects.

Brother HR5 Printer William Redman

This printer is available from most of the larger stores of Boots which sell computers and software.

The printer is good value for the money but I can only see one disadvantage is that it does not print Graphics.

The Brother HR5 can be worked by battery or mains, the mains adapter is bought seperately, the printer takes 4 U2 batteries.

With the printer you get a roll of paper, 4 batteries and 2 spare tapes.

This printer will also work on the BBC and other popular makes of microcomputers.

This printer will print on normal typing paper as well as Thermal paper (You have to remove the ribbon cassette to print on Thermal paper).

The largest paper that the printer will print on is A4 paper. The Brother HR5 also has a self print function (you press the on line button and switch on at the same time).

You also get a comprehensive booklet with the printer which explains everything in detail.

Light Screen Designer

Part 4

Toni Baker defines some of the keys for use with the program and suggests some modifications to the existing package



Shome mistakes...

Just two mistakes in Part Three — these were:

The byte at address DE88 should be 07, not 05 as printed. The byte at address DE95 should be B6, not D6 as printed.

Right, that over with, let's proceed to the next gripping part, in which we activate some of the keys. In Part One (with an amendment in Part Two) we gave a drawing of a keyboard overlay for the Spectrum, in which each key had a separate function. The keys which this article will activate are as follows: **UNDO** (key zero), **PLOT** (key Q), **DRAW_LINE** (key W), **CURSOR_TYPE** (key 0), **MOVE** (key A), **MARK** (key S), **CANCEL_MARK** (key D), **HIDE** (key enter), and **ESCAPE** (key space).

Before we get down to pushing any buttons though, I suppose I ought to tell you what each of these keys will actually *do* in the finished program. As you press the cursor keys (and remember that SHIFT with a cursor key produces an automatic REPEAT) you'll notice one cursor moves about the screen as you direct it, whilst another cusor stands till. The moving cursor is called the MAIN cursor, (or just "the cursor"), whereas the stationary one is called the ORIGIN cursor. Whenever you press the key PLOT then one single screen pixel at the locations of the (main) cursor will be PLOTted.

DRAW_LINE is also much as you'd expect it. It draws a line from the ORIGIN cursor to the MAIN cursor. The ORIGIN cursor is, in effect, a record of the last point PLOTted, and both PLOT and DRAW_LINE will move the origin cursor to its new position. Another way of moving the origin cursor is with the MOVE key, which simply moves this cursor without changing the screen.

If you find the appearance of the cursors on the screen unsightly, you can do one of two things. CURSOR_TYPE will change the appearance of the cursor from the existing crosswires to a single dot (and back again). Also, HIDE will render the cursors completely invisible, or make them visible again.

MARK simply marks a point on the screen for later reference. At present it will be of no use to us whatsoever but its subroutine is included anyway. CANCEL_MARK of course nullifies the effect of MARK.

Finally we have UNDO — a cunning little function which will undo any mistake — should you happen to make one. If, for instance, you draw a line in the wrong place then UNDO will erase it. Simple, but effective.

Alterations

There are some alterations which require to be made to the program as it exists so far. Specifically, the table of procedure addresses must be updated so that each key we define has a subroutine address associated with it. The full table runs from address DB42 to address DB8F, but for now we shall only need to update addresses DB6E onwards. Hunting around this article you should find a table of addresses between DB6E and DB8F, and the bytes you will need to POKE into them in order to make LSD Part Four workable.

There is another alteration we can make to the program, and that is an alteration/improvement in the MAIN LOOP section given in Part Three. In the flow diagram (In Part Three) there was a box marked "COPY THE SCREEN IF NECESSARY". This copies the entire screen, including the attributes bytes, into

```
                               ORG DE3D
21ADDE      ML_TEST            LD HL,DEAD,NULL_TABLE
011100                         LD BC,0011                  BC: = length of null table.
00                             NOP
00                             NOP
00                             NOP
00                             NOP
00                             NOP
00                             NOP
EDB1                           CPIR                        Is key pressed in null table?
280A                           JR Z,ML_ACTION              Jump if so.
2141DB                         LD HL,J_FLAGS high
CB66                           BIT 4,(HL)
CCC9DE                         CALL Z,DEC9, COPY_SCREEN    Copy screen if allowed.
            ML_ACTION          $
```

ML-test

```
DB6E 38 DF     DEFW DF38,CANCEL_MARK
DB70 52 00     DEFW 0052,INK
DB72 52 00     DEFW 0052,BRIGHT
DB74 52 00     DEFW 0052,USR
DB76 24 DF     DEFW DF24,CURSOR_TYPE
DB78 52 00     DEFW 0052,CLS
DB7A 52 00     DEFW 0052,FILL
DB7C 04 DF     DEFW DF04,DRAW_LINE
DB7E 30 DF     DEFW DF30,MARK
DB80 52 00     DEFW 0052,COPY
DB82 A4 DE     DEFW DEA4,ESCAPE
DB84 28 DF     DEFW DF28,HIDE
DB86 52 00     DEFW 0052,TEXT
DB88 BE DE     DEFW DEBE,UNDO
DB8A 52 00     DEFW 0052,PAINT
DB8C F8 DE     DEFW DEF8,PLOT
DB8E F3 DE     DEFW DEF3,MOVE
```

Null-Table

an area of RAM between addressed C000 and BAFF — this is so that the UNDO procedure can work correctly — all the UNDO routine needs to do is to unload the screen copy back onto the screen. This UNDOing is therefore a complementary function to the COPY_SCREEN routine itself, and it would be much more efficient if the two were handled by a single subroutine. We may also make further tests on the ''IF NECESSARY'' part of the clause, for not all of the procedures will need to be UNDOable. To this end I have revised the process and come up with the routine **ML_TEST** which directly overwrites the original code which appeared in Part Three.

And onto the new bits. . . .

New parts of the program shall now be given covering addresses DEAD to DF3D. the first seventeen bytes are a table (called NULL_TABLE) which lists those keys which do *not* require UNDOing, and directly following this is the UNDO/ COPY_SCREEN routine which was talked about earlier. At DEE6, however, we break off into a meaningless subroutine which is not a full procedure in itself. It is called ADJUST_BD since it prepares the B and D registers for the ROMs PLOT and DRAW routines. Calling from the label ADJUST_B alters the B register only. From then on follow the procedures for MOVE, PLOT, DRAW_LINE, CURSOR _TYPE, HIDE, MARK and CANCEL_MARK.

Although the program is far from complete, it can still do some useful things at present. You can draw straight lines, and you can rub them out. In part Five of Light Screen Designer I'll define some more of the keys for you — and put a little colour into things. See you then.



```
               NULL_TABLE                                          ORG    DEAD
00 07 08 0C    'BORDER', 'FLASH', 'OVER', 'RECALL'
0F 10 12 14    'PAPER', 'INVERSE 'CLEAR', 'STORE'
16 17 18 1A    'CANCEL_MARK', 'INK', 'BRIGHT', 'CURSOR_TYPE'
1E 20 21 23    'MARK', 'ESCAPE', 'HIDE', 'UNDO'
26             'MOVE
```

NULL_TABLE lists the keys for which the screen is not copied.

```
                             ORG DEBE
DDCB0166
UNDO                         BIT 4,(J_FLAGS)high
C0                           RET NZ                 Return if the memory is being used for some other purpose.
DDCB016E                     BIT 5,(J_FLAGS)high
C0                           RET NZ                 Return if screen copy has been corrupted.
A7                           AND A                  Reset the zero flag.
E5          COPY_SCREEN      PUSH HL
210040                       LD HL,D_FILE           HL: points to start of screen.
1100C0                       LD DE, D_FILE_COPY     DE: points to start of copy.
01001B                       LD BC,1B00             BC: length of screen memory.
2801                         JR Z,CSC_1             Jump if making copy of screen.
EB                           EX DE,HL
EDB0        CSC_1            LDIR                   Make required copy.
2106DB                       LD HL,DB0C,ORIGIN      HL: points to cursor info.
1100 DB                      LD DE,DB00,ORIGIN_COPY DE: points to duplicate cursor info.
4D                           LD C,L                 BC: 000C=length of info memory.
2801                         JR Z,CSC_2             Jump if making copy of screen.
EB                           EX DE,HL
EDB0        CSC_2            LDIR                   Make required copy.
E1                           POP HL
C9                           RET
```

COPY SCREEN subroutine

```
                             ORG DEE6
3EAF        ADJUST_BD        LD A,AF
92                           SUB D                  A:=adjusted coordinate.
57                           LD D,A                 D: now adjsuted.
3EAF        ADJUST_B         LD A,AF
90                           SUB B                  A:=adjusted coordinate.
47                           LD B,A                 B: now adjusted.
C9                           RET
```

Routine to prepare B and D registers for the ROM's PLOT routine.

```
                           ORG DEEF
ED5B0EDB MOVE_X            LD DE,(ORIGIN+2)    DE: pixel position of origin cursor prior to move.
220CDB   MOVE              LD (ORIGIN),HL      Change origin cursor (address).
ED430EDB LD
         (ORIGIN+2),BC     Change origin cursor (pixel
                           position).
C9       RET
```

Move procedure

```
                           ORG DEFB
CDF3DE   PLOT              CALL DEF3,MOVE          Move origin cursor to new position.
CREADE                     CALL DEEA,ADJUST_B      Adjust the B register ready to PLOT.
C3E522                     JP 22E5,PLOT_SUB        Plot the point.
```

PLOT procedure

```
                           ORG DF04
CDEFDE   DRAW_LINE         CALL DEEF,MOVE_X        Move origin cursor to new position.
                                                   DE: = previous coordinates.
CDE6DE                     CALL DEE6,ADJUST_BD     Adjust B and D registers.
EB                         EX DE,HL                HL: = previous coordinates.
227D5C                     LD (COORDS),HL          Store origin cursor coordinates as 'last point PLOTted'.
110101                     LD DE,0101
78                         LD A,B                  A = y coord of main cursor.
94                         SUB H                   A: = vertical DRAW parameter.
3003                       JR NC,DL_1              Jump if positive or zero.
2F                         CPL                     A: = ABS (vertical parameter).
16FF                       LD D,FF                 D:indicates vertical parameter is negative.
47       DL_1              LD B,A                  B: = ABS (vertical parameter).
79                         LD A,C                  A: = X coord of main cursor.
95                         SUB L                   A: = horizontal parameter.
3003                       JR NC,DL_2              Jump if positive or zero.
2F                         CPL                     A: = ABS (horizontal parameter).
1EFF                       LD E,FF                 E: indicates horizontal parameter is negative.
4F       DL_2              LD C,A                  C: = ABS (horizontal parameter).
C3BA24                     JP 24BA,DRAW_3          Draw line on screen.
```

The DRAW_LINE procedure

```
                           ORG DF24
3E40     CURSOR_TYPE       LD A,40                 A: has bit six set.
1802                       JR CT_H
3E80     HIDE              LD A,80                 A: has bit seven set.
2141DB   CT_H              LD HL,J_FLAGS high
AE                         XOR (HL)
77                         LD (HL),A               Complement the required flag.
C9                         RET
```

Subroutine to alter the image of the cursors on the screen

```
                           ORG DF30
2210DB   MARK              LD (MARKER),HL
ED4312DB                   LD (MARKER+2),BC        Move marker cursor.
C9                         RET
2113DB   CANCEL_MARK       LD HL,MARKER+3
36FF                       LD (HL),FF              Signal 'marker cursor not in use'.
C9                         RET
```

These two routines, MARK and CANCEL_MARK places/removes the MARK cursor to/from the main cursor position.

SNAP!

Eric Waters' simulation of the card game takes a weight off your mind, a sort of Brighton Rock?

Your future hangs over your head in this game in the shape of a one ton weight! This is the eventual fate of the loser in this two player reaction game from Eric Waters.

Although not a particularly long listing this game provides hours of challenging fun for all, so type it in and give it a try!!!

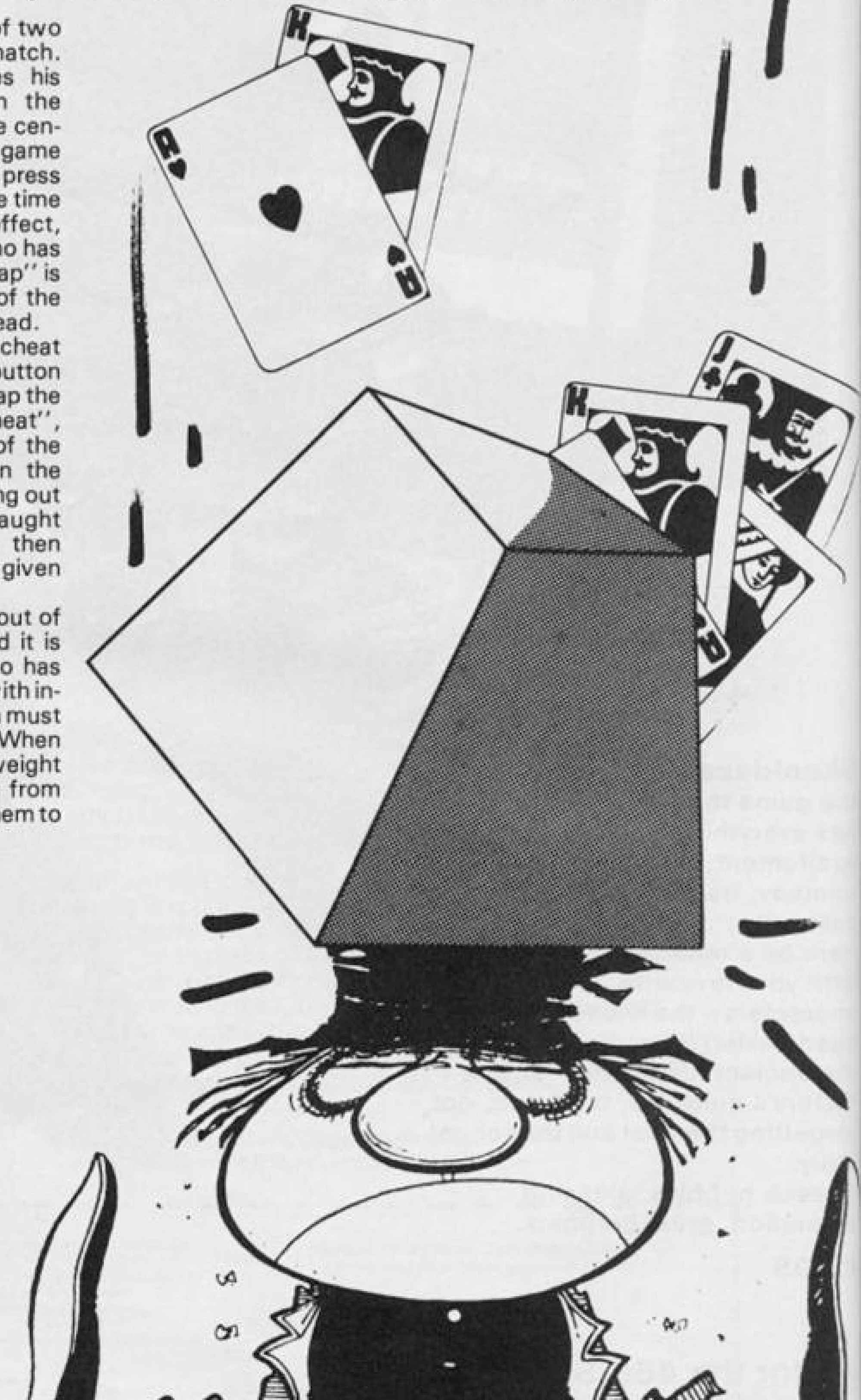
Once you have typed in this game and RUN it the screen goes blank for a short while as the ZX81 uses fast mode to set up the game. When the machine returns to slow mode you will see a room, two chairs and a window.

The players are asked, in turn to enter their names. When they do so they each appear sitting on their stools with their names above them, 20 cards in their hands and instructions as to which key each player is to use to call snap.

On starting the game a card is deducted from the first players hand, thus giving him 19 cards. The number one appears on the centre of the table indicating there is one card so far on the table. The number of the card the first player laid is shown on front of him. This sequence continues until the numbers of two cards laid by the players match. Whichever player presses his snap key is then given the number of the cards in the centre of the table and the game continues. If both players press their snap keys at the same time then the programme, in effect, tosses a coin to decide who has won. Whoever wins a "snap" is indicated by the flashing of the word "snap" over their head.

If either player tries to cheat by keeping their snap button depressed when it isn't snap the game stops. The word "cheat", together with the name of the one cheating, appears on the screen as do words pointing out that they have been caught cheating. Five cards are then taken from their hand and given to the other player.

When one player runs out of cards the game stops and it is shown on the screen who has run out of cards together with instructions that that person must now press their snap key. When they do so a one ton weight crashes down upon them from the ceiling and squashes them to the floor!



```
  10 PRINT AT 10,9;"A PROGRAMME
BY"
  20 PRINT AT 11,9;"ERIC R. WATE
RS"
  30 PRINT AT 12,14;"1984"
  40 PRINT AT 13,14;"████"
  50 FOR P=0 TO 25
  60 NEXT P
  70 CLS
  80 LET D$="SNAP"
  90 LET C$="SNAP"
 100 FOR J=0 TO 29 STEP 4
 110 PRINT AT 0,J;C$;AT 2,J;D$;A
T 4,J;C$;AT 6,J;D$;AT 8,J;C$;AT
10,J;D$;AT 12,J;C$;AT 14,J;D$;AT
 16,J;C$;AT 18,J;D$;AT 20,J;C$
 120 NEXT J
 130 FOR P=0 TO 20
 140 NEXT P
```

```
 150 CLS
 160 PRINT AT 0,2;C$;D$;C$;D$;C$
;D$;C$
 170 PRINT
 180 PRINT "AFTER ENTERING THE P
LAYERS NAMESPRESS THE FUNCTION K
EY"
 190 PRINT "THE PLAYERS WILL APP
EAR SITTING ON THEIR CHAIRS"
 200 PRINT "WHEN THE GAME STARTS
 YOU WILL   SEE:-"
 210 PRINT "A-THE AMOUNT OF CARD
S IN EACH   PLAYERS HAND"
 220 PRINT "B-THE NUMBERS ON THE
 CARDS THEY HAVE LAID"
 230 PRINT "C-THE AMOUNT OF CARD
S IN THE POT"
 240 PRINT
 250 PRINT "WATCH VERY CAREFULLY
"
 260 PRINT "WHEN THE TWO CARDS M
ATCH PRESS  YOUR SNAP KEY"
 270 PRINT
 280 PRINT "PLEASE PRESS ANY KEY
 TO CONTINUE"
 290 IF INKEY$="" THEN GOTO 290
 300 CLS
 310 FOR P=0 TO 15
 320 PRINT AT 9,9;"HEALTH WARNIN
G"
 330 PRINT AT 9,9;"HEALTH WARNIN
G"
 340 NEXT P
 350 PRINT AT 11,4;"PLAYING THIS
 GAME COULD"
 360 PRINT AT 12,6;"DAMAGE YOUR
HEALTH"
 370 PRINT AT 13,6;"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀"
 380 PRINT AT 20,4;"PRESS ANY KE
Y IF YOU DARE"
 390 PRINT AT 21,18;"▀▀▀▀▀▀▀▀▀▀▀▀▀
"
 400 IF INKEY$="" THEN GOTO 400
 410 CLS
 420 REM LETS
 430 LET C=0
 440 LET C1=20
 450 LET C2=20
 460 LET C3=0
 470 LET E$="CHEAT"
 480 LET F$="CHEAT"
 490 LET G$="▒"
 500 LET H$="O"
 510 LET J$="█-"
 520 LET K$="-█"
 530 LET L$=" ▌"
 540 LET M$="▐ "
 550 LET N$="▙"
 560 LET O$="▟"
 570 LET P$="O█▄▟"
 580 LET Q$="▙▄█O"
 590 LET R$="
          "
 595 LET T$="██████████"
 600 LET W$=CHR$ 157+"TON"
 610 REM ROOM PLAYERS ROUTINE
 620 FAST
 630 PRINT AT 2,12;"▛▀▀▀▀▀▀▀▜
                  ▙▄▄▄▄▄▄▄▟
                  ▌       ▐
                  ▙▄▄▄▄▄▄▄▟"
 640 FOR Y=0 TO 14
 650 PRINT AT Y,0;M$;AT Y,31;L$
 660 NEXT Y
 670 PRINT AT 0,0;"████████████
██████████████████"
 680 PRINT AT 14,0;"███████████
███████████████████"
 690 FOR A=11 TO 13
 700 PRINT AT 10,11;T$;AT A,13;M
$;AT A,17;L$
 710 NEXT A
 720 PRINT AT 11,7;G$;AT 11,23;G
$;AT 12,7;"I";AT 13,7;"I";AT 12,
23;"I";AT 13,23;"I"
 730 SLOW
 740 PRINT AT 21,0;"NAME OF FIRS
T PLAYER PLEASE"
 750 INPUT A$
 760 PRINT AT 21,0;R$
 770 PRINT AT 7,1;A$
 780 PRINT AT 15,0;"USE""Q""";AT
 16,0;"TO SNAP"
 790 PRINT AT 9,7;H$;AT 10,7;J$;
AT 11,8;M$;AT 12,8;N$
 800 PRINT AT 21,2;"NAME OF SECO
ND PLAYER PLEASE"
 810 INPUT B$
 820 PRINT AT 21,0;R$
 830 PRINT AT 7,23;B$
 840 PRINT AT 15,25;"USE""P""";A
T 16,25;"TO SNAP"
 850 PRINT AT 9,23;H$;AT 10,22;K
$;AT 11,22;L$;AT 12,22;O$
 860 PRINT AT 10,9;C1;AT 10,20;C
2
 870 PRINT AT 21,0;"PLEASE PRESS
 ANY KEY TO START"
 880 IF INKEY$="" THEN GOTO 880
 890 PRINT AT 21,0;R$
1000 REM GAME ROUTINE
1010 IF C1=0 OR C2=0 THEN GOTO 2
000
1020 LET C=C+1
1030 LET C1=C1-1
1040 LET C3=C3+1
1050 LET N1=INT (RND*4)+1
```

```
1060 PRINT AT 10,9;C1;AT 9,11;"
";AT 9,11;N1;AT 9,15;C3
1070 IF C1<10 THEN PRINT AT 10,1
0;" "
1080 IF C<2 THEN GOTO 1110
1090 IF N1=N2 THEN GOSUB 3000
1100 IF N1<>N2 THEN GOSUB 2500
1110 IF C1=0 OR C2=0 THEN GOTO 2
000
1120 LET C=C+1
1130 LET C2=C2-1
1140 LET C3=C3+1
1150 LET N2=INT (RND*4)+1
1160 PRINT AT 10,20;C2;AT 9,19;"
 ";AT 9,19;N2;AT 9,15;C3
1170 IF C2<10 THEN PRINT AT 10,2
1;" "
1180 IF C<2 THEN GOTO 1010
1190 IF N1=N2 THEN GOSUB 3000
1200 IF N1<>N2 THEN GOSUB 2500
1210 GOTO 1010
2000 REM OUT OF CARDS ROUTINE
2010 IF C1=0 THEN PRINT AT 10,9;
" ";AT 19,0;A$
2020 IF C2=0 THEN PRINT AT 10,20
;" ";AT 19,0;B$
2030 PRINT AT 20,0;"YOU HAVE RUN
 OUT OF CARDS-------NOW YOU MUST
 PRESS YOUR SNAP KEY"
2040 IF INKEY$="" THEN GOTO 2040

2050 PRINT AT 7,1;"
                               "
2060 FOR W=2 TO 12
2070 IF C1=0 THEN PRINT AT W,6;W
$;AT W-1,6;"    "
2080 IF C2=0 THEN PRINT AT W,20;
W$;AT W-1,20;"    "
2090 NEXT W
2100 IF C1=0 THEN PRINT AT 13,6;
P$
2110 IF C2=0 THEN PRINT AT 13,20
;Q$
2120 IF C1=0 THEN PRINT AT 8,23;
"HA HA"
2130 IF C2=0 THEN PRINT AT 8,5;"
HA HA"
2140 FOR P=0 TO 50
2150 NEXT P
2160 CLS
2170 PRINT AT 11,0;"PLEASE PRESS
 A KEY TO PLAY AGAIN"
2180 IF INKEY$="" THEN GOTO 2170

2190 CLS
2200 GOTO 420
2500 REM CHEAT ROUTINE
2510 IF INKEY$="" THEN RETURN
2550 IF INKEY$="P" THEN PRINT AT
 19,0;B$
2560 IF INKEY$="Q" THEN PRINT AT
 19,0;A$
2570 IF INKEY$="P" THEN LET C2=C
2-5
2580 IF INKEY$="P" THEN LET C1=C
1+5
2590 IF INKEY$="Q" THEN LET C2=C
2+5
2600 IF INKEY$="Q" THEN LET C1=C
1-5
2601 FOR P=0 TO 10
2602 PRINT AT 18,14;E$;AT 18,14;
F$
2603 NEXT P
2610 PRINT AT 20,0;"IT WASN""T S
NAP.NOW YOU WILL      LOOSE 5 CAR
DS--DON""T DO IT AGAIN"
2620 IF C1<0 THEN LET C1=0
2625 IF C2<0 THEN LET C2=0
2630 FOR P=0 TO 50
2640 NEXT P
2650 PRINT AT 10,9;"  ";AT 10,9;
C1;AT 10,20;"  ";AT 10,20;C2
2660 FOR P=0 TO 25
2670 NEXT P
2680 PRINT AT 18,0;R$;AT 19,0;R$
;AT 20,0;R$;AT 21,0;R$
2690 RETURN
3000 REM SNAP ROUTINE
3010 IF C<2 THEN RETURN
3020 IF INKEY$="Q" THEN GOTO 306
0
3030 IF INKEY$="P" THEN GOTO 312
0
3040 LET R=INT (RND*2)
3050 IF R=1 THEN GOTO 3120
3060 FOR Q=0 TO 15
3070 PRINT AT 8,5;D$;AT 8,5;"
 "
3080 NEXT Q
3090 LET C1=C1+C3
3100 PRINT AT 10,9;"  ";AT 10,9;
C1
3110 GOTO 3170
3120 FOR P=0 TO 15
3130 PRINT AT 8,23;D$;AT 8,23;"
 "
3140 NEXT P
3150 LET C2=C2+C3
3160 PRINT AT 10,20;"  ";AT 10,2
0;C2
3170 LET C3=0
3180 LET C=0
3190 PRINT AT 9,11;"         "
3200 NEXT P
3210 RETURN
4000 SAVE "SNAP"
5000 RUN
```

BREAKTHROUGH!

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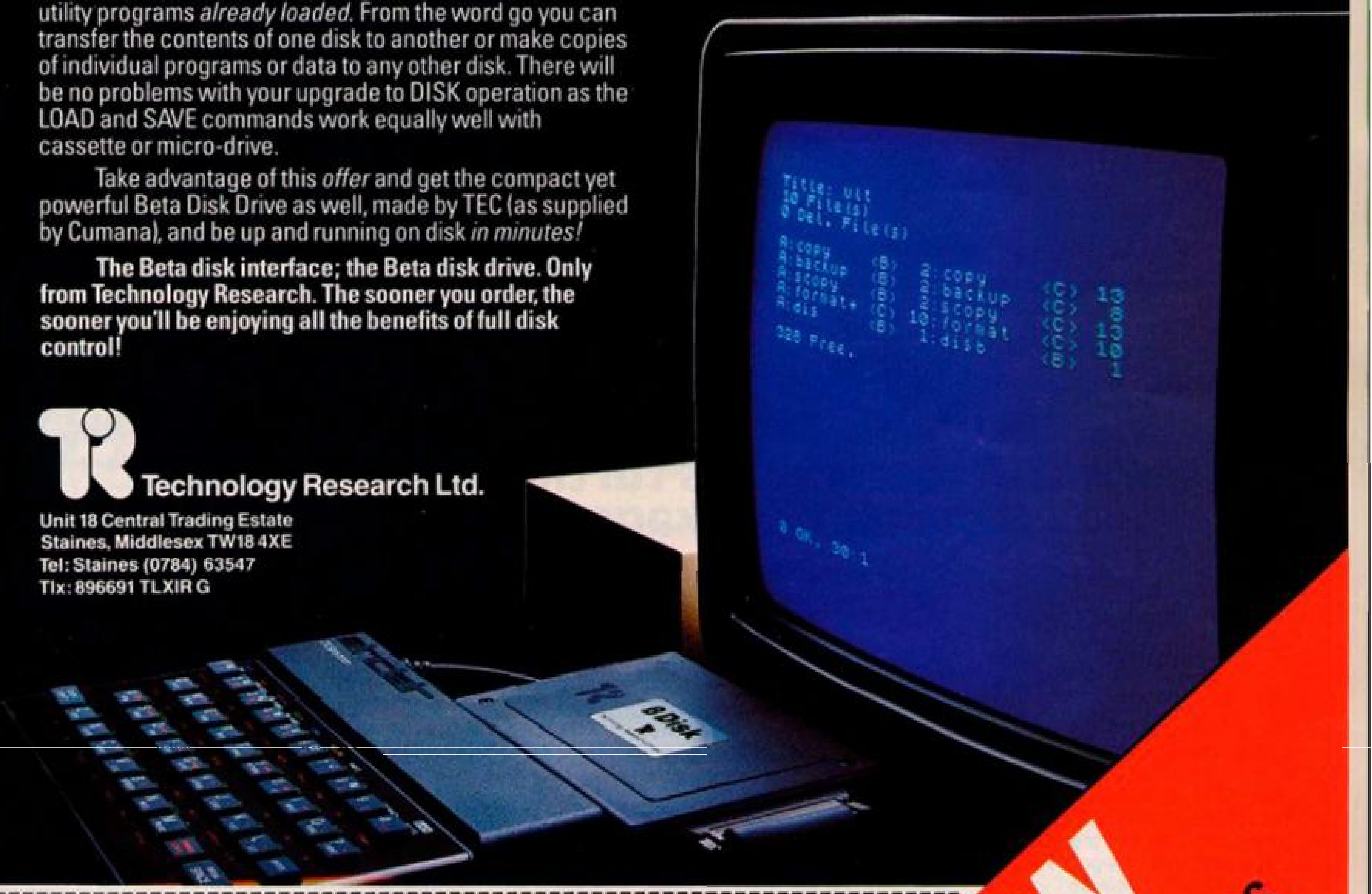
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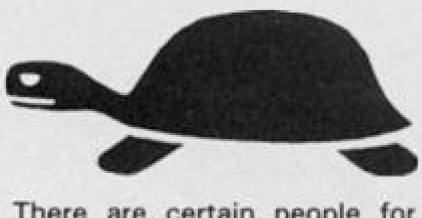
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Designs For Living



Colin Christmas turns turtle with Sinclair's package



There are certain people for whom the usual channels of communication, such as a cheerful "Hi. How are you?, Your place or mine?, Leave it out John", and so on, are virtually useless. In this category I put all aliens. Chiefly because I've nev er met any or at least any who would admit to having come from another world.

Also in this category, anyone from another country who has not learned English, or any other gibberish that I can't understand.

And most mathematicians.

That's my experience for what it's worth. The problem of course is language. Mathematicians seem to have their own and since my only consistent success in that field is to have failed every test and examination they cared to set for me, we never seem to have anything to talk about.

Imagine, then, a cosy meal late into the night and me deep in conversation with a mathematician . . . She is talking about computers, learning and languages — computer languages. Her enthusiasm for one in particular cannot be ignored. It was called LOGO and all this took place two years ago. She was less of a mathematician, more of a maths teacher.

I hope the relevance of that little anecdote to this article will soon be obvious. Regular readers of *ZX Computing* will at least be familiar with LOGO through reading excellent articles by Tim Hartnell and the series 'Slogo' by David Nowotnik who has written a BASIC program which gives us quite a powerful and versatile version of LOGO for the 48K Spectrum.

Readers will also (I hope) be well aware of the increasing number of utilities and toolkits being made available to Spectrum users for work in graphics and areas like computer aided design, something of a special interest of mine, as regular readers might have noticed.

Get Computers Into School

LOGO is probably best known as a graphics language. Many children today will be familiar with 'buggies' or 'turtles' which many schools bought as part of the package in the great 'Let's get computers into schools' campaign which in fact is still going strong.

These mini robots receive LOGO commands from a computer and move about on sheets of paper on the floor creating designs and shapes. Needless to say, Seymour Papert, the founding father of LOGO, had more than just graphics in mind when designing this language which would 'teach learning'.

He certainly had young children in mind however, and furthermore he had the world of mathematics in mind too. The common denominator would be the computer used as a tool by children. The language would need to be able to develop logical thinking, introduce children to computer programming and at the same time prepare them for future programming and languages other than the cumbersome BASIC.

This was Papert's task. LOGO the result.

It's not the only competitor in the field of languages for education. There's PASCAL, also 'procedure orientated' and Comal which is used educationally in Sweden and Norway.

But it's not my brief to discuss LOGO in detail — there's neither time nor space here — nor to offer comparisons with other languages. Rather, it is to give a considered welcome to **Sinclair's LOGO** package for the 48K Spectrum.

The package comprises two books, and a software cassette by **LCSI/SOLI**. The first book, Sinclair LOGO 1, deals exclusively with turtle graphics. The 'turtle' incidentally is not the robot kind but a graphics turtle which appears as a small triangle on the screen.

The graphics screen is known as the TURTLE'S FIELD, and this, apart from the bottom two lines of your TV screen, is your drawing board.

The size of the field can be changed using a very simple command (ALL commands, operations and procedures in LOGO are extremely easy to grasp — almost literally 'childsplay'), this particular command setting the aspect ratio to (XY) which changes the scales on which your images have been drawn.

Primitives

LOGO understands a number of words called PRIMITIVE PROCEDURES known as PRIMITIVES and many of these have a shorthand form. So that to make the turtle appear on the screen you type SHOWTURTLE or ST (its short form) and to make it disappear you type HIDETURTLE or HT.

The shape of the turtle gives you its POSITION and its HEADING. This is known as the turtle's STATE. Its STATE, BACKGROUND colour, all movement BACK, FORWARD, LEFT, RIGHT, PENCOLOUR (the

turtle is imagined as carrying a pen which it draws with, or not because you can instruct the turtle to lift its pen, in which case it does not draw as it moves), the boundaries of its movement, all of these can be changed with abbreviated commands.

Once you have used primitive procedures to draw a square or some other geometrical shape, then LOGO can be taught to understand all of these procedures as one procedure by simply giving it a name.

In this way, by building new procedures you are continually extending LOGO's vocabulary. And you can master it in minutes.

Documentation

The first book goes on to show how you can write programs which can manipulate words and lists, known as OBJECTS in LOGO.

When the software cassette is loaded, the Spectrum is in TEXTSCREEN mode. There are 22 lines available for text.

Every time you use a primitive related to the movement of the turtle, you go into the graphics mode, again with 22 lines for graphics and the two already mentioned which are for your conversation or communication with LOGO. To get back into TEXTSCREEN simply type TS. You cannot of course see the turtle in this mode.

The last part of the first book instructs the user on using VARIABLES, carrying out arithmetic operations, assigning values to variables, exploring the potential of LOGO for producing beautiful designs based on circles polygons and spirals, exploring the capability in LOGO of procedures being able to call or be called by any other procedure including itself (known as recursive procedures), and finally the setting up of a game using LOGO.

I can't truthfully imagine many people finding this first book difficult to use and for that matter, finding LOGO anything but fascinating and challenging to use.

The second book in the package describes itself as "a reference manual for experienced LOGO users, rather than a guide for newcomers."

All I can say here is that working through the first book is easy and enjoyable and having done that, by its own definition, the SINCLAIR LOGO package welcomes you to the second book as 'an experienced LOGO user'.

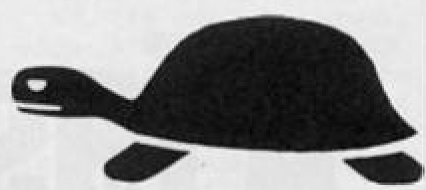
The reference manual is extremely comprehensive and so far has not let me down once. It is set out clearly and is very easy to use for reference. Fourteen chapters and two Appendices take you through first the basic rules for writing and combining procedures, the grammar or the language and from there the using of that grammar to make LOGO understand what you want it to do. Each of the PRIMITIVES is then defined and their use explained in considerable detail. It's this which makes it only suitable for experienced LOGO users, not its degree of difficulty in being understood or used.

Good News

Like any new message, the good news of LOGO has been steadily spreading since it was first announced in the sixties. Sinclair have at last now provided Spectrum users with their own 'bible' in the shape of this package. This means more disciples and I think the package will find its first converts amongs those who are in any way 'instructors'.

It is another language, to many of us refreshingly different from BASIC. It is widely recognised that you tend to prefer the language you first learned to program with and so the package will only appeal at first to the most open minded micro users. But now that it is here in this form, I foresee a new wave of programmers and a wider use of LOGO in the vocabulary of children and teachers in particular.

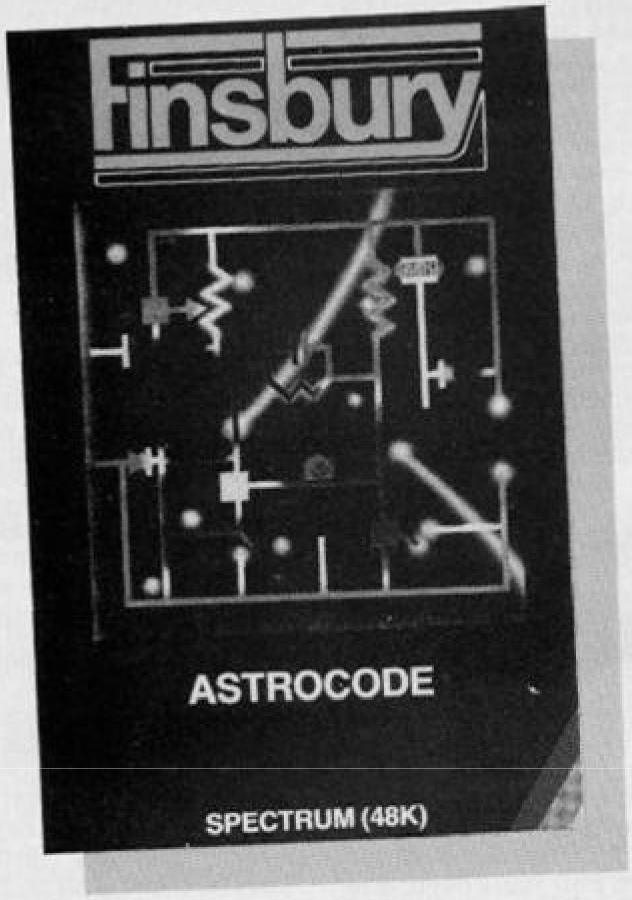
LOGO is something new to Spectrum uses. Its potential for early learning should not be ignored. Once again we have at our fingertips a tool which will become commonplace to future generations or at least act as a stepping stone on the journey toward new horizons for the home computer.




ROTRONICS WAFADRIVE

Quicksoft

Clive Smith gives a brief appraisal of the latest Spectrum software



Simple Business Accounts by Flowchart

They say the simple things in life are the best, and the **Simple Business Accounts** from **Flowchart** certainly proves it. S.B.A. comes in a plastic wallet along with a very simple instruction booklet, 8 pages and about 50 words to the page. In fact it wouldn't matter if you lost them as the program is menu driven and very easy to use. Your accounts are kept on a weekly basis and will keep all your balanced b/f. It will keep track of all your expenditures and instead of the programmer listing about 5000 headings which cannot be changed Flowchart list about 30 which you can change to suit yourself. You also have control over all the parameters, including password, name of company and account headings.

All reports can be made to hard copy and it will list all your expenditures separately for easy analysis. Reports can be made on the ZX printer or any printer using the ZX Interface 1 RS232 port, both types print a 32 column report.

Data can either be stored on cassette, about 13 weeks will fit onto a C60, so 2 tapes will hold a years figures. You can also store data in microdrive or disc if you wish. Everything in this program is made as simple as possible but nothing is left out. If you use a Simplex book you would find them very similar.

In fact, I found this program so good I have dropped my existing program in favour of this one to run my business on.

Well done Flowchart. A very well thought out program.

Astrocode By Finsbury Computers Ltd

By the look of the inlay I thought this was going to be (as stated on the inlay), tantalising and frustrating, not for the easily discouraged. In fact I doubt that I'll ever play the game again because basically it's 'Mastermind'.

You are supposed to be in a spacecraft which is stationary and cannot be moved until a colour code is broken. Of course you are in the flight path of several tons of meteors. Once the code is broken (or guessed a sequence of 4 colours) a graphic drawn circuit diagram conects up and you fly off to safety. All in all, I'm not impressed.

Master Mariner By Atlantis Software

Now this is tantalising and frustrating, and not for the easily discouraged. Master Mariner is written for the 48K Spectrum, and as the title may suggest it's about shipping.

You are Captain of a sailing ship called the 'Titan Trader' and you have to sail from one port to another carrying various cargoes which you have to buy and sell. Of course, it's not that simple as you have to contend with other factors.

First you have to borrow money from the finance company so you can buy your cargo, as well as paying harbour fees, wages and the dreaded income tax, plus a host of other charges which crop up in the game.

As well as handling the financial side there is, of course, the sailing side of it. You don't actually sail or steer the ship on screen, you just type in your destination and by clever graphics watch your ship sail out of the harbour. This isn't as easy as it sounds because en route you may meet pirates or run into bad weather and even lose all you cargo.

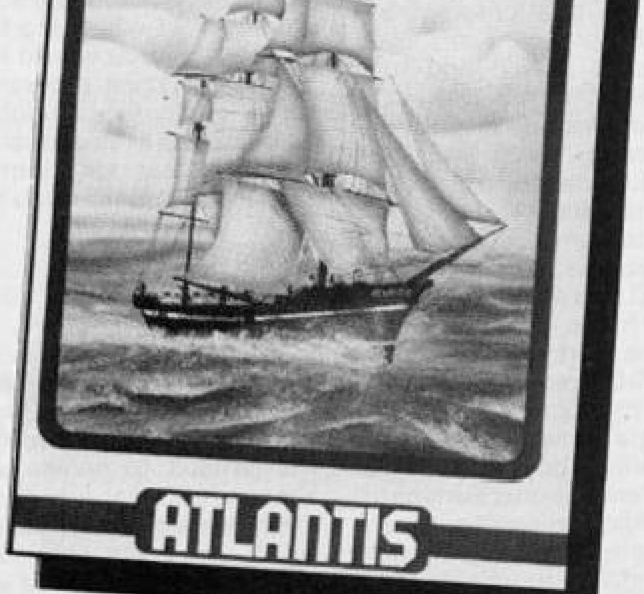
You have a choice of cargoes which you can carry and prices are different at each port. So if you bought arms in London and sailed to Liverpool you may find-they are cheaper when you get there and so you will lose money if you sold them.

The graphics are well drawn but are only there for your amusement. Great game this, one I can recommend to anyone.

NB. The editor is a sneaky fellow. After I wrote this thinking it was a full price game he tell's me its one of the new cheap range series! In this case it's fantastic value for money.

Garden Plant Directory By Practical Software

One of my biggest groans about utility programs is that some are a poor alternative to the thing they are trying to replace. Such as desk diary when its quicker to



write in the book than load the program every time.

Well at last I've found the reverse for once. This program is ideal if you're bit of a 'dimbo' (like me) when it comes to garden plants. The directory holds 350 flowers and shrubs and are listed in their common and Latin names and gives details of each one.

You can use the program in two ways. Either to identify a flower you have by inputing all it's charactersistics or to help you choose a particular flower that you want but don't know the name. For instance, say you wanted to plant some flowers but didn't know what type to get. You simply type in the characteristics you want ie: colour, height, spread, annual, biannual, when you want it to flower etc etc., and it will look through its criteria and try and find you a flower to match your needs. Great if you are just planning out your garden. There is also great room for improvement though.

First, the program runs very slowly (still gardner's don't move very fast either), and secondly 350 plants and shrubs is really a drop in the ocean to the number of plants there are. Quite often it will find nothing in file even when given the simplest of requests. I think they should have divided the shrubs and plants onto different tapes to make a larger directory. Still, a vey useful program and worth a look at — NB. 48K version only.

Stock Control by Kemp

You may or may not have noticed that the Kemp Stock Control program has been about for some time. Well, Kemp have improved their existing program and now have one compatible with ZX microdrive and an improved screen layout. The main features of this program are unlimited entries, audit trail, item/supplier search and it is menu driven with 9 menu options. These include display, update, correct, stock list, total stock value, delete, search and recorder/revalue.

The program has a capacity of 600 records per file and between 350 and 450 records per-file, which means one microdrive cartridge can hold 700 to 1000 records.

Each microdrive will save both program and data and with a full file takes about 30 seconds to load. Verification is automatic when loading or saving, to ensure security. The program and data can still be transfered onto cassette but it takes about three-and-a-half minutes to load. Verification is optional.

I liked the improved screen display which is well laid out, and has a green screen effect.

On entering date you first enter the stock number, up to 10 characters. Next is the supplier name which has only four characters but allowing 30 for description of goods. Next, your re-order level, seven figure max, and finally unit cost. There is also a ref number which has only four figures. I wish they gave more to hold long invoice numbers.

The search facility is fast, about two seconds, an will search either by supplier or stock number.

With a printer permanantly attached it will keep a full audit trail. The beauty of this program is that is will operate on the ZX printer and all Spectrum Centronics and RS232 printer interfaces to provide output on a 80 column printer. You can also select 32 or 64 characters per line.

With ease, you can print out any stock record, keep a daily file of all updates, corrections, creations etc. A stock list of all records with their balances plus anything found in the search, and when your rep rings for an order, will give an instant list of all stock that needs re-ordering.

The only fault I found was you have to enter the date every time you update a record, As you have to enter the date at the start, it would have been better to have the option of pressing one key to repeat the date when updating records of the option of changing it if needed.

The program also has an access-code to deter tampering, but this cannot be relied to strongly upon.

The cassette comes with a booklet to assist you but the program can be followed on the screen with ease. Recommended retail price is £19.95 including VAT which is a fraction of the price you would have to pay for a similar program used on a business computer. All cassettes are also guaranteed for one year and Kemp will answer any queries you have.

Omnicalc By Microsphere

In the beginning there was Omnicalc, But now, fresh from Microsphere is son of Omnicalc, yes, you guessed it, Omnicalc 2. It's difficult to review spreadsheets as it's not *what* they do, it's more what they will let you do. If you have never seen a spreadsheet before and you are in business it's worth looking at one, especially if you have to do a lot of calculations. The best way of explaining it to you is by asking you to imagine a large sheet of paper with lines running vetically and horizontally across it to form hundreds of small boxes. Across the top of the page they are numbered from 1 to 100 and down the side from A to Z. So each box has a co-ordinate ie: A1 or F4. Now, let's imagine that you were, say, buying and selling. You can enter your sales in one box (A1), then your cost in another box (A2) and have your profit appear in another box (A3). The idea is it will take data stored in one box and use it to perform calculations with data stored in another box and give you the answer in yet another box.

Your screen acts as a small window which can be moved up and down the spreadsheet to cover all the boxes available.

Imagine several of these boxes holding data and all interacting with each other, it would take hours to write a program in BASIC to handle things the spreadsheet can be set up to do in minutes. Now this can be used in all sorts of applications from manufacturing to sales figures.

The Omnicalc 2 program is one of the better spreadsheets I have seen, for it has the ability of giving you a histogram and can also be used with microdrive and interface 1. It has 99 columns across and 250 rows deep, and will use all the mathematical functions that the Spectrum can offer. One of it's features is that it can repeat equations down any column instead of having to key them in one by one.

All the actions on the spreadsheet are carried out by a series of one letter prompts, such as I-(input) which then gives the opportunity to Equate, or put in a value, or blank and write text.

Other promts include C(calculate), D(decode), G(goto), K(copy), T(sub-total) and a host of others which the 31 page instruction manual can best explain. In fact Omnicalc 2 has 4 programs, OM2, om64000, omniconvert and omdelete. The last two have only relevance to those who own the original Omnicalc. Om2 occupies the very top of the Spectrum memory, whereas om64000 leaves the bytes between 64000 and 65535 for any complex printer interface.

Results can be printed out on a ZX printer and to a full size printer connected to a suitable interface.

If you think you need a spreadsheet for your business needs then I think you won't go far wrong with this one.

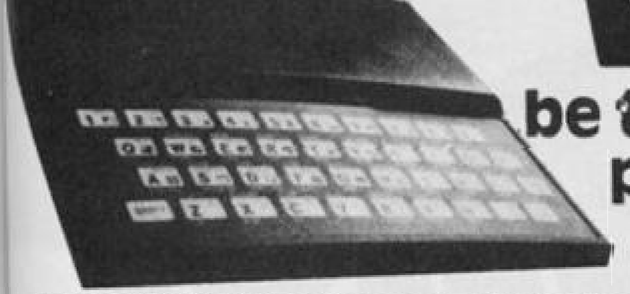
Garden Birds By Natsoft

My apology to Natsoft, I had said 'Garden Birds' didn't contain the Bullfinch. Well, it does. I also said that you were offered three choices of bird size while in fact there are seven. After the success of this program Natsoft are to release two extra programs, 'Country Birds' and 'Coastal Birds'. This gives a total of over 250 species in all, covering all the birds commonly seen in Britain.

(Consider your wrist slapped — Ed.)



ZX81 and Spectrum Software to be Won!





be tempted by these programs from Temptation Software

Temptation Software are based in historical Rye and have just announced the addition of **"The Journey"** to their range of programs.

The journey is a full blown adventure game with graphics and self willed interactive characters. What makes it specially interesting to *ZX Computing* readers is that it was written by Alan Davis who is a *ZX Computing* contributor. In our last issue we published the final part of one of his adventures and we have something special from him tucked away for the future!

Temptation have a varied range of programs on the market for both machines, Admiral Graf Spee, Baron and Dungeons of Doom for both ZX81 and Spectrum and Challenge, Las Vegas and of course The Journey for the Spectrum only.

The Prizes

Temptation are offering 60 packs of three programs — 30 sets of ZX81 and 30 Spectrum — for the lucky winners of our competition. The ZX81 pack consists of their three programs for this machine and the Spectrum pack consists of Challenge, Las Vegas and The Journey.

Please tick which prize you would like when you return the form and who knows, the postman may soon be calling on you!

The Competition

In line with the theme of Temptation's new program all we want you yo fo id yo indentify the adventurers by their famous journey.

The Rules

- This competition is open to all UK and Northern Ireland readers of *ZX Computing*, except employees of Argus Specialist Publications Ltd. Their printers and distributors, employees of Temptation Software, or anyone associated with the competition.
- As long as the correct coupon is used (a postcard in this case), there is no limit to the number of entries from each individual.
- All entries must be postmarked before January 31st 1985. The prizes will be awarded to the first 60 entries picked at random which bear the correct answers, the decision to be made by the Editor of *ZX Computing*. No correspondence will be entered into with regard to the results and it is a condition of entry that the Editor's decision is accepted as final.
- The winners will be notified by post and the results will be published in a future issue of *ZX Computing*.

Unique competition results

There was a *moderate* response to the Unique 'wordsquare' competition (*ZX Computing* August/September), but perhaps we'll put that down to the fact that it was the holiday season... good weather... that sort of thing. Anyway, the lucky winners were:

Mr M Bradley of Coventry
Mr C D Newbold of Leicester
Lawrence Miller of Liverpool
Mr R Gunn of Edinburgh
Simon Turner of West Yorkshire
R Ramshaw of Tyne and Wear
Mr M J Beaman of Essex
Mr Guri Nediri of Berkshire
Sukhdev Singh of Middlesex
(*your club information is on it's way, Sukhdev — Ed*)
Alan Hourihane of Wigan
Mr L Grant of Hawick in Scotland
and
M J Davies of Dyfed, Wales.

Each of the above should have received their prizes by the time they have read this.

Thanks to all of you who entered our competition.

The entries have been pouring in for the PRISM competition (*ZX Computing* October/November) and each morning I enter the office and see that tray marked 'competition' bulging fit to burst. I'll have a wonderful time opening that lot (groan). However, that's part of the reason that I'm here, so if you want to keep quite young man happy, enter the Temptation competition and win yourself some free software. After all, **WHAT HAVE YOU GOT TO LOSE?**

Jamie Clary.

***ZX Computing* Temptation Competition,**
1 Golden Square,
London W1R 3AB

Name The Adventurer

Q. On his journey he discovered America.

A. ....

Q. This person took elephants over the Alps when journeying.

A. ....

Q. An antartic journey ended in disappointment and tragedy for this man.

A. ....

Q. A man famous for his journeys, has a mint sweet named after him.

A. ....

Q. This *tarty* musician took rats and children on his journeys.

A. ....

Q. An African journey was necessary before this man could meet Dr. Livingstone.

A. ....

NAME ....

ADDRESS ....

....

....

....

"My machine is a Spectrum/ZX81" (please delete as applicable).

The ultimate development from agf



Designed exclusively for the ZX Spectrum, Protocol 4 brings you game control customising in a way that no other interface does. It can accept all commercially standard joysticks, including the Quickshot II with 'rapid fire' or Trackball controllers, and is compatible with ALL Spectrum software. **OPERATES LIKE FIXED OPTION INTERFACES OR CAN BE FULLY HARDWARE PROGRAMMED**

The flexibility of Protocol 4 control is achieved by a specially designed 'CustomCard' system. CustomCards are easily programmed to suit all types of games.

Simply clip in a programmed card for immediate customised control. With preset cards supplied Protocol 4 can emulate the following control standards: AGF/Protek, Kempston and ZX Interface 2 — both players. You can change or reprogram blank cards (1 supplied) to get the responses you want — even on games without joystick options.

Utilising Hardware Programmed technology you have the benefit of automatic eight direction control, no power-down programming loss, guaranteed conflict-free operation with other peripherals, including microdrives, and no extra software to load or awkward joystick movements and key presses to make each time you load another game. The keyboard remains fully operative at all times.

It is also perfectly possible to connect up to five Protocol 4's on one Spectrum, each programmed separately, for multiple player control — only possible with the hardware programmed design.

Incorporated into the design is a computer Reset button for clearing the computer memory between games without pulling the power plug out.

Fully guaranteed for 18 months, Protocol 4 comes supplied with five CustomCards, ten Quick Reference Programming Cards and complete instructions.



PROGRAMMABLE INTERFACE

As the first fully hardware programmed joystick interface, this product has become well established over the past year and will accept ALL standard joysticks or trackballs, including Quickshot II with 'rapid fire', for use with ALL Spectrum or ZX81 software — not just those with a joystick option.

* No Software programming required.
* Programming is *not* lost when power is disconnected between games.
* Eight way movement — with or without the fire button pressed — only requires setting of the four normal directions.
* Compatibility is guaranteed with ALL key reading techniques — machine code or BASIC.
* Several interfaces can be separately programmed and fitted to one computer for multiple player games.

Keyboard operation is totally unaffected by this interface, as with all AGF add-ons, and will never conflict with *any* other device fitted at the same time.

Twelve months guarantee, key programming information and a pack of Quick Reference Cards, to speed up setting of the clips, are supplied with full instructions.

INTERFACE II

The AGF Interface II represents the best low cost introduction to joystick control.

The 'AGF' control standard is now offered by over 100 games or utility programs for use with any joystick or trackball.

Any game which is controlled by the cursor movement keys (5,6,7,8) or has a Protek option is also compatible with Interface II.

A rear connector allows other peripherals to be connected at the same time.

This product is available for either the Spectrum or ZX81, is supplied with full instructions, a 12 month guarantee, and a 12½% discount voucher against further AGF mail-order purchases.

ROMSLOT

The new AGF RomSlot is designed for anyone who already owns a programmable joystick interface, or prefers to use the keyboard to control games, and would like to add the facility of ROM cartridge software to their system.

RomSlot will accept the Sinclair range of instant loading games and will also be compatible with the new releases from Parker Software — exciting new games only to be available in ROM format.

This system allows instant play. Your computer memory size is not important and you will be able to play games that could ordinarily require more RAM.

RomSlot incorporates an extra feature called 'Restart'. This allows you to instantly *restart* the ROM game.

RomSlot is guaranteed for 12 months and has a full width expansion connector to accept joystick interfaces, speech units and printers etc.

QUICKSHOT

The Quickshot joystick is an excellent value game controller incorporating suction cups for sure-footed precision with a comfortably contoured handle offering a convenient top firing button as well as one on the base.

QUICKSHOT II

Quickshot II has improved styling with a trigger type firing button as well as the top firing action, with a broader base for greater suction stability.

It also has a unique 'Auto-Fire' facility which at the flick of a switch provides a constant rapid firing action simulating a fast trigger finger.

	PRICE	TICK BOX OPPOSITE REQUIRED ITEM
AGF Protocol 4	£29.95+£1.00 p&p	☐
AGF Programmable Interface	£24.95+£1.00 p&p	☐
AGF RomSlot	£ 9.95+£0.50 p&p	☐
AGF Interface II	£ 9.95+£0.50 p&p	☐
Quickshot II Joystick	£10.50+£0.50 p&p	☐
Quickshot Joystick	£ 7.95+£0.50 p&p	☐
Extra 'CustomCards' (5 per pack	£ 3.95 inc. p&p	☐
Extra Quick Reference. Programming Cards (10 per pack)	£ 0.65 inc. p&p	☐
Specify Computer	ZX81	☐
	Spectrum	☐

I enclose cheque/Postal Order for ....

Please debit my Access/Visa/Diners Club Card

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Signature ....

My Name ....

Address ....

.... ZX

Send to: AGF Hardware, Dept , Freepost, Bognor Regis, West Sussex, PO22 9BY.

Trade Enquiries ring (0243) 823337

There's nowhere else to go agf

The next step



Ray Elder gives hints on developing your programming with the aid of a program by Steven Bridge of Bristol.

OK.
So you've done the really hard work, thought of something to write, sat down and produced a working, debugged program. You are pleased. The rest of the family make approving sounds and you decide that you will send your brain-child to be published. Some weeks later an envelope drops through the door and you rush to open it to find out just how many of those blue notes they are offering.

Shock! Horror! They are so unaware of real talent that they have rejected your masterpiece. Obviously they're pretty stupid so you cancel your subscription and look for another, more appreciative magazine.

Probably 75% or more of the programs submitted to ZX Computing are rejected because I already have a similar program awaiting publication. The new one may have different features or been programmed differently, but once I have accepted (or if the previous editor has accepted) a program then sooner or later we will publish it.

Most of the other rejections are because the program has been left in an unrefined state. What do I mean by that?

Steven Bridge has very generously given me permission to use his program to try and demonstrate how you can refine a program. I do appreciate how difficult it is to accept critism and to allow your work to be criticised in print must be twice as bad, so my most heartfelt thanks to him for taking the hot seat!

Steve's Program

Take a look at Program 1. This is Steve's original program, it has no drastic bugs, (there is one very minor one that is not fatal — can you spot it?), and it works fine, performing the task intended.

So what's wrong with it? Answer, nothing! But let's take what I call "the next step".

The first thing I noticed was the system of producing the superb music, obviously Steve had developed this note by note in the Data statement and used a system where 999 was the "rogue value" which signalled the end of that section.

However, now that the music was completely developed it is no longer essential. Also is seems a shame to only use it once. With this in mind I created a subroutine at 8000-8020 in my program (program 2).

The RESTORE allows me to call it more than once and find the correct starting point of the Data each time, knowing the exact length allowed a FOR/NEXT loop to be used, variables a and b can both be READ in one go and the whole lot fits in one line.

The next thing I noticed was the frequent use of PAUSE 100: CLS and so I thought another subroutine would be in order. On my listing I created this subroutine at line 8100.

Notice I used an empty loop instead of PAUSE. This is partly a leftover technique from my ZX81 days when PAUSE caused a screen flicker and an occasional crash. However I still use it on the Spectrum because on occasions a player may be slow to remove his finger from a key and cause the pause to be ignored. Remember that a pause is cut short by a key being pressed! Variable qu is initialised in Steve's program but never used. He was probably going to use it as a question counter then developed his program in another way. As it is redundant we ought to remove it for neatness' sake.

Steve owns a 16K Spectrum, so, for the sake of memory saving, I reduced variable "score" to "sc". It would have been even better to have used "s" but I wanted to keep a balance between economy and legibility. For the latter Steve's name is the ideal!

The Big Step

So much for the simple, nit picking modifications. To get a good overall view of his program, and in fact any program, it is essential to get a print out of the listing. For this purpose the sadly defunct ZX printer or the Alphacom 32 is ideal.

With a listing available the pattern of the program emerged and I traced it through looking for repetitive actions, initially in order to create subroutines but soon I became aware that it

could be summarised in a simple form as follows:

- 1 Print at the same position the question number.
- 2 Print at the same position the question and 3 options.
- 3 Get an input.
- 4 Beep.
- 5 Check answer, if wrong print this at the same pos. and give correct answer.
- 6 Check answer, if correct print this, add 10 to score.
- 7 Next question.

The only things that changed were the questions, the options and the position the correct answer was in.

As so much was repeated I looked for a way to set up a format and use Data for the different questions each time.

The obvious one was the one I used. Each question was set up as a DATA line starting from line 9000, and each line consists of:

- The question — a string variable
- The 3 options — numeric variables
- The position of the answer in the options — a numeric variable

This makes it simplicity itself to amend, alter, increase or replace any of the questions as they all follow the same layout. To store the three options I used a DIMensioned array. This would prove easier to find when printing the correct answer. Also while I was about it I thought it might be nice to give the correct answer even if the player had chosen correctly, a confirmation of his choice.

Finally I used variable a (for answer) to hold the position in the options of the correct answer.

The Final Step

Line 150 RESTOREd the Data pointer to the start of the questions and line 200 set up a loop counter i.

I decided that as we knew how many questions were to be asked a main loop was suitable.

Using the value of "i" it was straightforward to print up the question number as Steve had in his original. The data was READ into q$, each element of c() and "a" then the pause, cls subroutine was called. All in the one line.

Line 210 prints out all the information. Notice the loop "j" to print each c() element, and how I utilised its value to provide suitable spacing and the numbering. This was found by trial and error. Quite often a fair bit of time needs to be spent on just formatting the screen to give a balanced, effective display. Of course, each person has his own preferences for the way a screen is laid out, this only happens to be mine.

Line 212 gets the input. Here I used INKEY$. My reason was that the less key-pressing the user did the more he could concentrate on the questions. The fact that only a single number from one to three was required made it most appropriate. I also introduced a simple but effective check that a suitable key was pressed, all other keys (except BREAK of course) are ignored.

Line 215 provides the BEEP then goes on to check for the correct answer by comparing the VALue of the input a$ to variable "a" read from the Data. The variable "a" is also used to identify the correct element of c() for printing in both "correct" and "wrong" messages.

The line then increases the score and jumps over line 216 to line 220. Line 216 is the "wrong" message and is only reached if VAL a$ is not equal to "a" when checked by line 215.

Lines 600 to 701 follow Steve's format of presenting the messages and line 701 uses PAUSE 0 to wait for key. At this stage there has been a lengthy gap since the last required key press so there should not be much chance of lingering fingers.

Further Steps

Well, Steve agreed with me that this program was much more efficient and easily adaptable than before, and we talked about other modifications it was now possible to make with the extra memory available.

Most of these we'll leave for you to experiment with. The first one was that, for the sake of user friendliness, a prompt to "Press 1,2 or 3" would be nice after each question the prompt removed on a valid input.

Then we thought that we could increase the number of questions. A possible idea — especially with a 48K machine — would have to be twice the number of questions in memory as were required to be asked and chose them at random. This would make for tremendous variation each time the game was played. A system of checking that a question wasn't repeated would need devising for this!

Steve's original program

```
   2 LET score=0: LET qu=1
 100 BORDER 0: PAPER 0: INK 7: C
LS
 110 PRINT AT 4,7;"Q U I Z M A S
 T E R"
 112 PRINT AT 6,6; INK 4; BRIGHT
 1; FLASH 1;"Press any to to sta
rt"
 113 PAUSE 0: CLS
 115 PRINT AT 8,13;"QUESTION 1"
 116 READ a: IF a=999 THEN  GO T
O 200
 117 READ b: BEEP a/10,b: GO TO
 116
 118 DATA 2,7,2,7,1,9,1,12,1,11,
1,9,2,14,2,14
 119 DATA 1,14,1,16,1,11,1,12,2,
9,2,9,1,9,1,12,1,11,1,9,2,7
 200 DATA 999
 201 CLS
 210 PRINT AT 2,0;"In what year
did Captain Scott  Reach the sou
th pole."
 213 PRINT AT 5,0;"1.1912 2.1911
 3.1910"
 214 INPUT  LINE a$
 215 IF a$<>"1" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1912"
 216 IF a$="1" THEN  BEEP .1,2:
PRINT AT 10,13; FLASH 1;"CORRECT
": LET score=score+10
 217 PAUSE 100: CLS
 218 PRINT AT 8,13;"QUESTION 2":
 PAUSE 100
 220 CLS
 223 PRINT AT 2,0;"In what year
did London Airport open."
 224 PRINT AT 5,0;"1.1945  2.194
6  3.1943"
 225 INPUT  LINE a$
 226 IF a$<>"2" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1946"
 227 IF a$="2" THEN  BEEP .1,1:
PRINT AT 10,13;"CORRECT": LET sc
ore=score+10
 228 PAUSE 100: CLS
 230 PRINT AT 8,13;"QUESTION 3":
 PAUSE 100: CLS
 231 PRINT AT 2,0;"In what year
was the first       London Marath
on."
 232 PRINT AT 5,0;"1.1982  2.198
1  3.1980"
 233 INPUT  LINE a$
```

```
 234 IF a$<>"2" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1981"
 235 IF a$="2" THEN  BEEP .1,1:
PRINT AT 10,13;"CORRECT": LET sc
ore=score+10
 300 PAUSE 100: CLS
 310 PRINT AT 8,13;"QUESTION 4"
 312 PAUSE 100: CLS
 314 PRINT AT 2,0;"In What year
were the cats eyes first manufac
tured."
 315 PRINT AT 5,0;"1.1934  2.193
6  3.1935"
 316 INPUT  LINE a$
 317 IF a$<>"3" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1935"
 318 IF a$="3" THEN  BEEP .1,1:
PRINT AT 10,13;"CORRECT": LET sc
ore=score+10
 320 PAUSE 100: CLS : PRINT AT 8
,13;"QUESTION 5": PAUSE 100: CLS

 321 PRINT AT 2,0;"In what year
was Halley's        comet first s
ighted."
 332 PRINT AT 5,0;"1.1910  2.191
1  3.1909"
 400 INPUT  LINE a$
 445 IF a$<>"1" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1910": PAUSE 100: CLS
 450 IF a$="1" THEN  PRINT AT 10
,13;"CORRECT": LET score=score+1
0: PAUSE 100: CLS
 460 PRINT AT 8,13;"QUESTION 7":
 PAUSE 100: CLS
 467 PRINT AT 2,0;"In What year
was the opening of the forth bri
dge."
 468 PRINT AT 5,0;"1.1964  2.196
1 3.1963": INPUT  LINE a$
 469 IF a$<>"3" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1963": PAUSE 100: CLS
 470 IF a$="3" THEN  BEEP .1,1:
PRINT AT 10,13;"CORRECT": LET sc
ore=score+10: PAUSE 100: CLS
 473 PRINT AT 8,13;"QUESTION 8":
 PAUSE 100: CLS
 474 PRINT AT 2,0;"In what year
did England win theworld cup."
 475 PRINT AT 5,0;"1.1966  2.196
7  3.1964": INPUT  LINE a$
 480 IF a$<>"1" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1966": PAUSE 100: CLS
 481 IF a$="1" THEN  BEEP .1,1:
PRINT AT 10,13;"CORRECT": LET sc
ore=score+10: PAUSE 100: CLS
 490 PRINT AT 8,13;"QUESTION 9":
 PAUSE 100: CLS
 500 PRINT AT 2,0;"In what year
was oil discovered in the north
sea by B.P."
 510 PRINT AT 5,0;"1.1970  2.196
9  3.1973": INPUT  LINE a$
 511 IF a$<>"1" THEN  BEEP .1,1:
 PRINT AT 10,3;"WRONG THE ANSWER
 WAS 1970"
 512 IF a$="1" THEN  BEEP .1,1:
PRINT AT 10,13;"CORRECT": LET sc
ore=score+10
 513 PAUSE 100: CLS
 600 PRINT AT 10,14;"Game over":
 PAUSE 100: CLS
 700 PRINT AT 4,6;"Y O U R  S C
O R E = ";score
 701 PRINT AT 7,4; BRIGHT 1; INK
 2; FLASH 1;"Press any key to pl
ay again"
 702 INPUT  LINE a$: IF a$="y" T
HEN  RUN
 703 STOP
 800 FOR a=0 TO 3: SAVE "Quizmas
ter" LINE 1: NEXT a
```

We even mused on a way to present the options in a different order so that the date had to be remembered and not the position in the options. For this one we created these lines:

```
205 FOR j = 1 TO 4
206 LET x = INT (RND *3) + 1:
LET y = INT (RND *3) + 1: IF
x = y THEN GO TO 206
207 IF x = a THEN LET a = y: GO
TO 209
208 IF y = a THEN LET a = x
209 LET z = c(x): LET
c(x) = c(y):LET = z: NEXT j
```

This swaps two elements of c() at random, four times. Lines 207/208 keep track of the position of the correct answer.

Another idea was that the option data could be made into strings so that some answers could be words as well as numbers and open up a whole new range of questions. All that would be necessary would be to DIMension c$(3,4) and use c$() instead of c(), the number 4 would be altered to the length of the longest word in the answer.

As it was now getting to 1.30am and I had to write this lot up, we parted.

And so, here endeth the lesson......

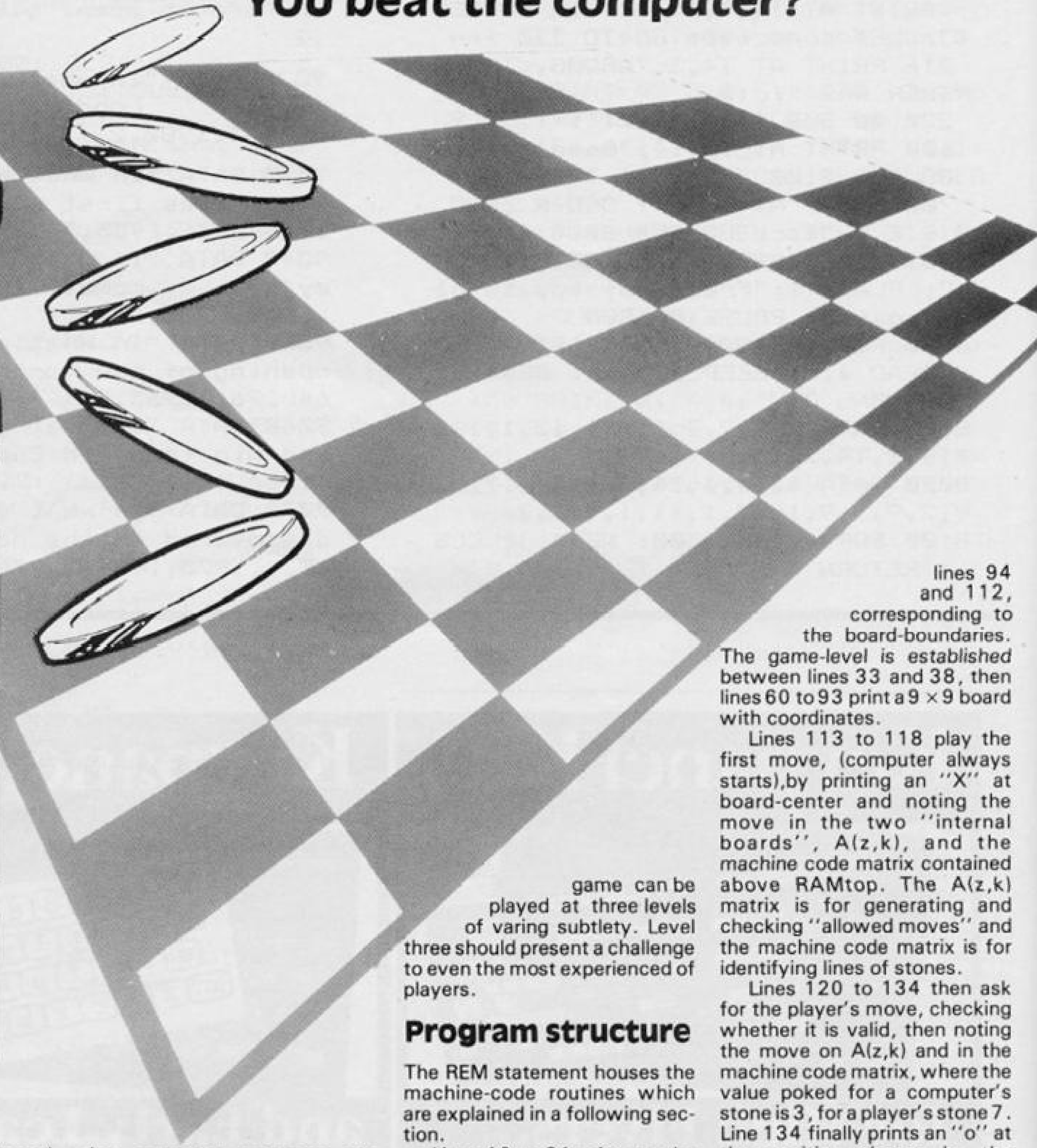
The "new improved" version of Quizmaster

```
 100 LET sc=0: DIM c(3): BORDER
0: PAPER 0: INK 7: CLS
 120 PRINT AT 4,7;"Q U I Z M A S
 T E R";AT 6,6; INK 4; BRIGHT 1;
 FLASH 1;"Press a key to start."
 150 PAUSE 0: GO SUB 8000: CLS :
 RESTORE 9000
 200 FOR i=1 TO 8: PRINT AT 8,13
;"QUESTION ";i: READ q$,c(1),c(2
),c(3),a: GO SUB 8100
 210 PRINT AT 2,0;q$: FOR j=1 TO
 3: PRINT AT 4+j*2,13;j;"  ";c(j)
```

```
;: NEXT j
 212 LET a$=INKEY$: IF a$="" OR
a$<"1" OR a$>"3" THEN  GO TO 212
 215 BEEP .1,1: IF VAL a$=a THEN
  PRINT AT 14,9;c(a);" is CORREC
T": LET sc=sc+10: GO TO 220
 216 PRINT AT 14,3;"WRONG, THE A
NSWER WAS ";c(a)
 220 GO SUB 8100: NEXT i
 600 PRINT AT 10,14;"Game over":
 GO SUB 8100
 700 PRINT AT 4,6;"Y O U R  S C
O R E = ";sc: GO SUB 8000
 701 PRINT AT 7,4; BRIGHT 1; INK
 2; FLASH 1;"Press any key to pl
ay again": PAUSE 0: RUN
8000 RESTORE 8010: FOR i=1 TO 19
: READ a,b: BEEP a/10,b: NEXT i:
 RETURN
8010 DATA 2,7,2,7,1,9,1,12,1,11,
1,9,2,14,2,14
8020 DATA 1,14,1,16,1,11,1,12,2,
9,2,9,1,9,1,12,1,11,1,9,2,7
8100 FOR j=1 TO 300: NEXT j: CLS
 : RETURN
9000 DATA "In what year did Capt
ain Scott  Reach the south pole.
",1912,1911,1910,1
9010 DATA "In what year did Lond
on Airport open.",1945,1946,1943
,2
9020 DATA "In what year was the
first        London Marathon.",198
2,1981,1980,2
9030 DATA "In What year were the
 cats eyes first manufactured.",
1934,1936,1935,3
9040 DATA "In what year was Hall
ey's       comet first sighted."
,1910,1911,1909,1
9050 DATA "In What year was the
opening of the forth bridge.",19
64,1961,1963,3
9060 DATA "In what year did Engl
and win theWorld Cup.",1966,1967
,1964,1
9070 DATA "In what year was oil
discovered in the north sea by B
.P.",1970,1969,1973,1
```

Gobang

A brilliant version of Chinese Checkers from A N Morton in W. Germany — can YOU beat the computer?



If you enjoy playing board games and are fascinated by their hidden logic, then this program is for you!

Gobang must be the Chinese forerunner of "naughts and crosses", although somewhat more elaborate, as one would expect from an oriental game.

The aim of the game is to make a line of five "stones" diagonally, vertically, or horizontally. The black or white stones are placed on the intersections of the board. The rules of the game are fully explained in the BASIC program. This program combines machine-code and BASIC, so that computer responses are very rapid, considering the lengthy calculations involved in generating a single move. The game can be played at three levels of varing subtlety. Level three should present a challenge to even the most experienced of players.

Program structure

The REM statement houses the machine-code routines which are explained in a following section.

Lines 10 to 31 print out the rules of the game, which are displayed for as long as it takes to set up the variables between lines 94 and 112, corresponding to the board-boundaries. The game-level is established between lines 33 and 38, then lines 60 to 93 print a 9 × 9 board with coordinates.

Lines 113 to 118 play the first move, (computer always starts),by printing an "X" at board-center and noting the move in the two "internal boards", A(z,k), and the machine code matrix contained above RAMtop. The A(z,k) matrix is for generating and checking "allowed moves" and the machine code matrix is for identifying lines of stones.

Lines 120 to 134 then ask for the player's move, checking whether it is valid, then noting the move on A(z,k) and in the machine code matrix, where the value poked for a computer's stone is 3, for a player's stone 7. Line 134 finally prints an "o" at the position chosen by the player.

From here on the work starts! Lines 137 to 143 route the program to various subroutines depending on the number of moves "M" played. Lines l200 to 308 produce the first three opening moves After the sixth move, the program is sent on a long and tortuous journey through countless IF....THEN statements to finally end up at line 145 where the move is then printed on screen.

After the ninth move and each move thereafter, lines 119 and 140 route the program to subroutines 600 and 641 to

Table 1. Machine code routines for Gobang.

Lines 1000 to 1074	search for 4 stone-lines (computer)
Lines 899 to 909	search for 4 stone-lines (player)
Lines 910 to 937	generate winning or blocking move
Lines 800 to 867	search for 3 stone-lines (level 3 computer)
Lines 700 to 731	search for 3 stone-lines (level 3 player)
Lines 732 to 777	generate appropriate move for a "3-line"
Lines 480 to 508	search for 3 stone-lines (level 2,3, computer)
Lines 400 to 407	search for 3 stone-lines (level ,3, player)
Lines 418 to 446	generate appropriate move
Lines 309 to 379	deal with the 2 stone-lines

check for a possible win, in which case the result of the game is printed, together with the number of moves played. Lines 630 and 658 clear the machine code matrix, then an option for relay is given. The rest of the program generates appropriate moves after identification of 4,3 or 2 stone-lines in the machine code matrix. Thereafter, the program operates as described in table 1.

Variables used in program

(Z,K); (R,C); (J,I); (W,L); (F,E); (S,T); represent board coordinates, (line, column), at different points of the program.

A(Z,K); represents the value assigned to a particular point (Z,K) on the board.

A = 3 for board-boundaries
A = − 1 for computer-stone "x"
A = 2 for player-stone "o"
A = 0 for unoccupied positions

M; represents number of moves played, H; the game-level, all other variabls are for calculations.

Machine code routines

(USR 16514, USR 16650, USR 16637)
The machine code routines are the "heart" of the program, without which the game would be much too slow. Essentially, these routines search through a block of memory, reserved above RAMtop, for values corresponding to stone-patterns, which are POKEd into the memory-matrix after each move. When a "line" is identified, the routine returns to BASIC, where the contents of reg-pair BC are decoded to enable the appropriate move to be generated. The value of B gives the position of the first stone in the line. The C-value corresponds to the type of line, vertical, horizontal or diagonal. If no line is found, then BC = 0, so USR 16514 or USR 16650 = 0. If the move generated by USR 16514 is invalid, as can happen at board-boundaries, then the program is sent back to search for another line via USR 16650, after the BC values have been repoked into addresses 31985 to 31988. Addresses 32000 to 32002 are reserved for stone-value (3 or 7), line length and line-sum. USR 16637 clears addresses 32017 to 32145 corresponding to the machine code matrix.

Getting it all together

Before doing anything, RAMtop must be lowered to address 31985, by typing in

```
POKE 16388,241
(+NEWLINE)
POKE 16389,124 : : : :
NEW
```

To check that RAMtop is at 31985, enter

```
PRINT PEEK 16388 + 256
* PEEK 16389
```

The next step is to type in the hex loader program, making sure that the REM statement contains at least 145 characters and that the first address to be poked (if using another hex loader), is 16514. Now RUN the loader program and type in the hex code in the same order as listed in "Machine code routines", pressing NEWLINE after each line of code entered. After entering the last line of code, type in ST to stop program. Now delete each line of the loader program leaving the REM line, then type in POKE 16510,0 + NEWLINE to give an unerasable REM line. As a precaution, SAVE the REM line on tape. You are now ready to GO-BASIC!

With the REM line still in memory, type in the BASIC program as listed. Type RUN 1076 + NEWLINE to SAVE the completed program on tape. The program will then start, asking you for a game! You might need a break after all the typing you will have done up to this point! By entering S after the board has been printed, you can opt out (apart from pulling out the jack!). Remember to lower RAMtop to 31985 before loading the program from tape.

Table 1. Machine code routines for Gobang. Hex loader for Gobang machine code. BASIC listing for Gobang.

Hex	Mnemonic	Comment
0E00	LD C,0	
3A007D	LD A,(32000)	A = 3 or 7
21117D	LD HL,32017	First address of matrix
0681	LD B,129	Count 129
BE	CP (HL)	Search for first stone
2804	JRZ, + 4	Jump if found
23	INC HL	Next address
10FA	DJNZ, − 6	Jump back to search
C9	RET	Return to BASIC BC = 0
C5	PUSH BC	Save count
E5	PUSH HL	Save address of first stone
ED4B017D	LD, BC,(32001)	B = (32002), C = (32001)
23	INC HL	Next address horiz-line
86	ADD A,(HL)	Line summing
10FC	DJNZ, − 4	Jump to next address
A7	AND A	Clear C-flag
B9	CP C	Line found?
2005	JRNZ, + 5	Jump if not found
E1	POP HL	
C1	POP BC	B = start of line
0E01	LD C,1	C = 1 horiz-line
C9	RET	Return to BASIC.
E1	POP HL	First stone address
E5	PUSH HL	Save address
3A007D	LD A,32000)	A = 3 or 7
ED4B017D	LD BC,32001)	B = line-length, C = line-sum
110F00	LD DE,15	Vertical line step
19	ADD HL,DE	Next address on line
86	ADD A,(HL)	Line summing
10F9	DJNZ, − 7	Jump to next address
A7	AND A	Clear C-flag
B9	CP C	Line found?
2005	JRNZ, + 5	Jump if not
E1	POP HL	
C1	POP BC	
0E0F	LD, C,15	C = 15 for vertical line
C9	RET	To BASIC
E1	POP HL	
E5	PUSH HL	
3A007D	LD A,(32000)	
ED4B017D	LD BC,(32001)	
111000	LD DE,16	R-diagonal line-step
19	ADD HL,DE	Next address on line
86	ADD A,(HL)	Line-sum
10F9	DJNZ, − 7	
A7	AND A	
B9	CP C	Line found?
2005	JRNZ, + 5	
E1	POP HL	
C1	POP BC	
0E10	LD C,16	C = 16 for R-diag-line
C9	RET	To BASIC
E1	POP HL	
E5	PUSH HL	
111C00	LD DE,28	
19	ADD HL,DE	
7E	LD A,(HL)	
ED4B017D	LD BC,(32001)	
A7	AND A	
110E00	LD DE, 14	L-diagonal step
ED52	SBC HL,DE	Next address up line
86	ADD A,(HL)	Line-sum
10F8	DJNZ, − 8	Next address
B9	CP C	Line found?
2005	JRNZ, + 5	Jump if not
E1	POP HL	
C1	POP BC	
0E0E	LD C,14	C = 14 for L-diag-line
C9	RET	To BASIC
E1	POP HL	
C1	POP BC	
3A007D	LD A,(32000)	
1894	JR, − 108	Jump back to search
0000		
0681	LD B,129	Set counter to 129
21117D	LD HL,32017	First address of matrix
3600	LD (HL),0	Set contents to zero
23	INC HL	Next address
10FB	DJNZ, − 5	Jump back to set
C9	RET	
0000		
2AF17C	LD HL,(31985)	
ED4BF37C	LD BC,(31987)	
18E3	JR, − 29	Jump back to search

Hex loader for Gobang machine code.

```
   1 REM ........................
.....THERE ARE 146 CHARACTERS IN
.....THIS LINE..................
................................
...........................
  10 LET X=16514
  20 INPUT A$
  25 IF A$="ST" THEN STOP
  30 PRINT AT 21,0;"          ";
AT 21,1;A$
  40 SCROLL
  50 POKE X,16*CODE A$+CODE A$(2
)-476
  60 LET X=X+1
  70 LET A$=A$(3 TO )
  80 IF A$<>"" THEN GOTO 50
  90 GOTO 20
```

BASIC listing for Gobang.

```
   0 REM THIS LINE CONTAINS THE
         MACHINE CODE AND IS 146
         CHARACTERS LONG
   1 PRINT "PRESS ANY KEY TO BEG
IN"
   2 IF INKEY$="" THEN GOTO 2
   3 REM C*SPICA
   5 RAND USR 16637
   6 CLS
  10 CLEAR
  11 PRINT AT 0,1;"**GOBANG OR C
HINESE CHEQUERS**"
  12 PRINT AT 1,1;"*************
****************"
  13 PRINT AT 3,13;"O X O"
  14 PRINT AT 4,13;" OXO "
  15 PRINT AT 5,13;"XXOXX"
  16 PRINT AT 6,13;" OXO "
  17 PRINT AT 7,13;"O X O"
  18 PRINT AT 8,1;"THE GAME IS P
LAYED BY PLACING "
  19 PRINT AT 9,1;"BLACK(X) AND
WHITE(O) STONES   "
  20 PRINT AT 10,1;"ON THE INTER
SECTIONS OF THE    "
  21 PRINT AT 11,1;"BOARD, UNTIL
 ONE PLAYER HAS "
  22 PRINT AT 12,1;"SUCCEEDED IN
 MAKING A LINE WITH"
  23 PRINT AT 13,1;"FIVE OF HIS
STONES,EITHER ALONG"
  24 PRINT AT 14,1;"A LINE OR DI
AGONALLY ACROSS ."
  25 PRINT AT 15,1;"I,""CHING TH
E MASTER"",ALWAYS "
  26 PRINT AT 16,1;"PLAY BLACK A
ND ALWAYS START."
  27 PRINT AT 17,13;"O X O"
  28 PRINT AT 18,13;" OXO "
  29 PRINT AT 19,13;"XXOXX";AT 1
9,19;"(WAIT)"
  30 PRINT AT 20,13;" OXO "
  31 PRINT AT 21,13;"O X O"
  32 GOTO 94
  33 CLS
  34 PRINT AT 10,11;"CHOOSE LEVE
L 1,2,3"
  35 PRINT AT 11,11;"+NEWLINE"
  36 INPUT Z$
  37 IF Z$<"1" OR Z$>"3" THEN GO
TO 34
  38 LET H=VAL Z$
  59 CLS
  60 FOR K=4 TO 20 STEP 2
  61 FOR Z=4 TO 20
  62 PRINT AT Z,K;"■"
  63 NEXT Z
  64 NEXT K
  65 FOR Z=4 TO 20 STEP 2
  66 FOR K=4 TO 20
  67 PRINT AT Z,K;"■"
  68 NEXT K
  69 NEXT Z
  70 FOR L=4 TO 20 STEP 2
  75 PRINT AT 21,L;L/2
  78 PRINT AT 21,3;"▩"
  80 NEXT L
  85 FOR N=4 TO 20 STEP 2
  90 PRINT AT N,21;N/2
  91 PRINT AT 3,21;"▩"
  92 NEXT N
  93 GOTO 113
  94 DIM A(12,12)
  95 FOR P=2 TO 10
  96 FOR Q=1 TO 12
  97 LET A(Q,1)=3
  98 LET A(Q,11)=3
  99 LET A(Q,12)=3
 102 LET M=0
 105 LET A(11,P)=3
 106 LET A(1,P)=3
 107 LET A(12,P)=3
 110 NEXT Q
 111 NEXT P
 112 GOTO 33
 113 LET Z=6
 114 LET K=6
 115 POKE (31985+(15*Z)+K),3
 116 LET A(Z,K)=-1
 117 PRINT AT 2*Z,2*K;"X"
 118 LET M=M+1
 119 IF M>=9 THEN GOSUB 600
 120 PRINT AT 19,23;" ENTER";AT
20,23;" Z?,K?";AT 21,23;"(S/STOP
```

```
)"
 121 INPUT A$
 122 IF A$="S" THEN GOTO 684
 123 INPUT B$
 124 IF B$="S" THEN GOTO 684
 125 IF CODE A$<29 OR CODE A$>37
 OR CODE B$<29 OR CODE B$>37 THE
N GOTO 120
 127 LET Z1=VAL A$
 128 LET K1=VAL B$
 130 IF Z1<1 OR Z1>10 OR K1<1 OR
 K1>10 THEN GOTO 120
 131 IF A(Z1,K1)<>0 THEN GOTO 12
0
 132 LET A(Z1,K1)=2
 133 POKE (31985+(15*Z1)+K1),7
 134 PRINT AT 2*Z1,2*K1;"O"
 135 LET M=M+1
 136 PRINT AT 19,23;"          ";
AT 20,23;"             ";AT 21,23;"W
AIT      "
 137 IF M=2 THEN GOTO 200
 139 IF M=4 THEN GOTO 300
 140 IF M>=9 THEN GOSUB 641
 143 IF M>=6 THEN GOTO 1000
 145 LET Z=R
 146 LET K=C
 149 GOTO 115
 190 LET Z=6
 195 LET K=6
 200 LET R=Z+1
 201 LET C=K
 202 IF A(R,C)=0 THEN GOTO 145
 203 LET R=Z
 204 LET C=K+1
 205 IF A(R,C)=0 THEN GOTO 145
 206 LET R=Z-1
 207 LET C=K-1
 208 IF A(R,C)=0 THEN GOTO 145
 209 LET R=Z-1
 210 LET C=K+1
 211 IF A(R,C)=0 THEN GOTO 145
 212 LET R=Z+1
 213 LET C=K-1
 214 IF A(R,C)=0 THEN GOTO 145
 215 LET R=Z+1
 216 LET C=K+1
 217 IF A(R,C)=0 THEN GOTO 145
 300 LET R=Z+1
 301 LET C=K
 302 IF A(R,C)=0 THEN GOTO 145
 303 LET R=Z+1
 304 LET C=K+1
 305 IF A(R,C)=0 THEN GOTO 145
 306 LET C=K+1
 307 LET R=Z
 308 IF A(R,C)=0 THEN GOTO 145
 309 LET V2=1
 310 POKE 32000,3
 311 POKE 32002,2
 312 POKE 32001,6
 313 RAND USR 16514
 314 LET J1=USR 16514
 315 IF J1=0 THEN GOTO 350
 316 LET B2=INT (J1/256)
 317 LET C2=J1-256*B2
 318 LET J=INT ((161-B2)/15)
 319 LET I=(161-15*J)-B2
 320 IF C2=1 THEN GOTO 332
 321 IF C2=15 THEN GOTO 340
 322 IF C2=16 THEN GOTO 360
 323 IF C2=14 THEN GOTO 370
 324 POKE 31985,(146-B2)
 325 POKE 31986,125
 326 POKE 31987,0
 327 POKE 31988,B2
 328 RAND USR 16650
 329 LET J1=USR 16650
 330 IF V2=1 THEN GOTO 315
 331 GOTO 356
 332 LET R=J
 333 LET C=I+2
 334 IF A(R,C)=0 THEN GOTO 145
 335 LET C=I+1
 336 IF A(R,C)=0 THEN GOTO 145
 337 LET C=I-1
 338 IF A(R,C)=0 THEN GOTO 145
 339 GOTO 324
 340 LET R=J+2
 341 LET C=I
 342 IF A(R,C)=0 THEN GOTO 145
 343 LET R=J+1
 344 IF A(R,C)=0 THEN GOTO 145
 345 LET R=J-1
 346 IF A(R,C)=0 THEN GOTO 145
 347 GOTO 324
 350 LET V2=0
 351 POKE 32000,7
 352 POKE 32002,2
 353 POKE 32001,14
 354 RAND USR 16514
 355 LET J1=USR 16514
 356 IF J1=0 THEN GOTO 190
 357 GOTO 316
 360 LET R=J+2
 361 LET C=I+2
 362 IF A(R,C)=0 THEN GOTO 145
 363 LET R=J+1
 364 LET C=I+1
 365 IF A(R,C)=0 THEN GOTO 145
 366 LET R=J-1
 367 LET C=I-1
 368 IF A(R,C)=0 THEN GOTO 145
 369 GOTO 324
 370 LET R=J+2
 371 LET C=I-2
 372 IF A(R,C)=0 THEN GOTO 145
 373 LET R=J+1
```

```
374 LET C=I-1
375 IF A(R,C)=0 THEN GOTO 145
376 LET R=J-1
377 LET C=I+1
378 IF A(R,C)=0 THEN GOTO 145
379 GOTO 324
400 LET U=0
401 POKE 32000,7
402 POKE 32002,2
403 POKE 32001,21
404 RAND USR 16514
405 LET W1=USR 16514
406 IF W1=0 THEN GOTO 309
407 GOTO 487
418 LET R=W-1
419 LET C=L
420 IF A(R,C)=0 THEN GOTO 145
421 LET R=W+3
422 IF A(R,C)=0 THEN GOTO 145
423 GOTO 500
425 LET R=W
426 LET C=L-1
427 IF A(R,C)=0 THEN GOTO 145
428 LET C=L+3
429 IF A(R,C)=0 THEN GOTO 145
430 GOTO 500
432 LET R=W-1
433 LET C=L+1
434 IF A(R,C)=0 THEN GOTO 145
435 LET R=W+3
436 LET C=L-3
437 IF A(R,C)=0 THEN GOTO 145
438 GOTO 500
440 LET R=W-1
441 LET C=L-1
442 IF A(R,C)=0 THEN GOTO 145
443 LET R=W+3
444 LET C=L+3
445 IF A(R,C)=0 THEN GOTO 145
446 GOTO 500
480 LET U=1
481 POKE 32000,3
482 POKE 32002,2
483 POKE 32001,9
484 RAND USR 16514
485 LET W1=USR 16514
486 IF W1=0 THEN GOTO 400
487 LET B=INT (W1/256)
488 LET C=W1-256*B
489 LET W=INT ((161-B)/15)
490 LET L=(161-15*W)-B
495 IF C=15 THEN GOTO 418
496 IF C=1 THEN GOTO 425
497 IF C=14 THEN GOTO 432
498 IF C=16 THEN GOTO 440
500 POKE 31985,(146-B)
501 POKE 31986,125
502 POKE 31987,0
503 POKE 31988,B
504 RAND USR 16650
506 LET W1=USR 16650
507 IF U=1 THEN GOTO 486
508 GOTO 406
512 STOP
600 POKE 32000,3
605 POKE 32002,4
610 POKE 32001,15
624 RAND USR 16514
625 LET L1=USR 16514
626 IF L1<>0 THEN GOTO 630
627 RETURN
630 RAND USR 16637
631 PRINT AT 21,23;"        "
632 PRINT AT 10,23;"I WIN"
636 PRINT AT 11,23;"IN";M;"MOVE
S"
637 PRINT AT 0,1;"PRESS ANY KEY
FOR REPLAY"
639 IF INKEY$="" THEN GOTO 637
640 GOTO 670
641 POKE 32000,7
643 POKE 32002,4
645 POKE 32001,35
654 RAND USR 16514
655 LET G=USR 16514
656 IF G<>0 THEN GOTO 658
657 RETURN
658 RAND USR 16637
659 PRINT AT 21,23;"        "
660 PRINT AT 10,23;"YOU WIN"
661 PRINT AT 11,23;"IN";M;"MOVE
S"
662 PRINT AT 0,1;"PRESS ANY KEY
FOR REPLAY"
666 IF INKEY$="" THEN GOTO 662
667 GOTO 673
670 CLS
671 PRINT AT 10,1;"TRY AGAIN AT
LEVEL";H
672 GOTO 679
673 CLS
674 IF H=3 THEN PRINT AT 10,1;"
MASTER CHING IS IMPRESSED"
675 IF H=1 THEN PRINT AT 10,1;"
THAT WAS EASY,TRY NEXT LEVEL"
676 IF H=2 THEN PRINT AT 10,1;"
WELL PLAYED-GO TO LEVEL3"
679 PRINT AT 11,1;"WARNING THIS
GAME IS ADDICTIVE"
680 PRINT AT 12,1;"SHALL WE CON
TINUE?(Y)OR(N)"
681 IF CODE INKEY$=51 THEN GOTO
684
682 IF CODE INKEY$=62 THEN GOTO
5
683 IF CODE INKEY$<>51 OR CODE
INKEY$<>62 THEN GOTO 680
684 CLS
```

```
685 PRINT AT 20,0;;"THANK YOU F
OR PLAYING";AT 21,0;"PRESS RUN+N
EWLINE TO RESTART "
686 STOP
700 LET Q1=0
701 POKE 32000,7
702 POKE 32002,3
703 POKE 32001,21
704 RAND USR 16514
705 LET F1=USR 16514
706 IF F1=0 THEN GOTO 480
707 LET B3=INT (F1/256)
708 LET C3=F1-256*B3
709 LET F=INT ((161-B3)/15)
710 LET E=(161-15*F)-B3
711 IF C3=1 THEN GOTO 730
712 IF C3=15 THEN GOTO 742
713 IF C3=16 THEN GOTO 754
714 IF C3=14 THEN GOTO 766
730 IF A(F,E-1)<>-1 AND A(F,E+4
)<>-1 THEN GOTO 732
731 GOTO 820
732 LET R=F
733 LET C=E+1
734 IF A(R,C)=0 THEN GOTO 145
735 LET R=F
736 LET C=E+2
737 IF A(R,C)=0 THEN GOTO 145
738 LET R=F
739 LET C=E+3
740 IF A(R,C)=0 THEN GOTO 145
741 GOTO 820
742 IF A(F-1,E)<>-1 AND A(F+4,E
)<>-1 THEN GOTO 744
743 GOTO 820
744 LET R=F+1
745 LET C=E
746 IF A(R,C)=0 THEN GOTO 145
747 LET R=F+2
748 LET C=E
749 IF A(R,C)=0 THEN GOTO 145
750 LET R=F+3
751 LET C=E
752 IF A(R,C)=0 THEN GOTO 145
753 GOTO 820
754 IF A(F-1,E-1)<>-1 AND A(F+4
,E+4)<>-1 THEN GOTO 756
755 GOTO 820
756 LET R=F+1
757 LET C=E+1
758 IF A(R,C)=0 THEN GOTO 145
759 LET R=F+2
760 LET C=E+2
761 IF A(R,C)=0 THEN GOTO 145
762 LET R=F+3
763 LET C=E+3
764 IF A(R,C)=0 THEN GOTO 145
765 GOTO 820
766 IF A(F-1,E+1)<>-1 AND A(F+3
,E-3)<>-1 THEN GOTO 768
767 GOTO 820
768 LET R=F-1
769 LET C=E+1
770 IF A(R,C)=0 THEN GOTO 145
771 LET R=F+1
772 LET C=E-1
773 IF A(R,C)=0 THEN GOTO 145
774 LET R=F+2
775 LET C=E-2
776 IF A(R,C)=0 THEN GOTO 145
777 GOTO 820
800 LET Q1=1
801 POKE 32000,3
802 POKE 32002,3
803 POKE 32001,9
804 RAND USR 16514
805 LET F1=USR 16514
806 IF F1=0 THEN GOTO 700
807 LET B3=INT (F1/256)
808 LET C3=F1-256*B3
809 LET F=INT ((161-B3)/15)
810 LET E=(161-15*F)-B3
811 IF C3=1 THEN GOTO 830
812 IF C3=15 THEN GOTO 842
813 IF C3=16 THEN GOTO 854
814 IF C3=14 THEN GOTO 866
820 POKE 31985,(146-B3)
821 POKE 31986,125
822 POKE 31987,0
823 POKE 31988,B3
824 RAND USR 16650
825 LET F1=USR 16650
826 IF Q1=1 THEN GOTO 806
827 GOTO 706
830 IF A(F,E-1)<>2 AND A(F,E+4)
<>2 THEN GOTO 732
831 GOTO 820
842 IF A(F-1,E)<>2 AND A(F+4,E)
<>2 THEN GOTO 744
843 GOTO 820
854 IF A(F-1,E-1)<>2 AND A(F+4,
E+4)<>2 THEN GOTO 756
855 GOTO 820
866 IF A(F-1,E+1)<>2 AND A(F+3,
E-3)<>2 THEN GOTO 768
867 GOTO 820
899 LET U1=0
900 POKE 32000,7
901 POKE 32002,3
902 POKE 32001,28
903 RAND USR 16514
904 LET S1=USR 16514
905 IF S1=0 AND H=3 AND M<10 TH
EN GOTO 700
906 IF S1=0 AND H=3 THEN GOTO 8
00
907 IF S1=0 AND H=2 THEN GOTO 4
80
```

```
908 IF S1=0 AND H=1 THEN GOTO 3
09
909 GOTO 1035
910 LET R=S
911 LET C=T+4
912 IF A(R,C)=0 THEN GOTO 145
913 LET R=S
914 LET C=T-1
915 IF A(R,C)=0 THEN GOTO 145
916 GOTO 1060
917 LET R=S-1
918 LET C=T
919 IF A(R,C)=0 THEN GOTO 145
920 LET R=S+4
922 IF A(R,C)=0 THEN GOTO 145
923 GOTO 1060
924 LET R=S-1
925 LET C=T-1
926 IF A(R,C)=0 THEN GOTO 145
927 LET R=S+4
928 LET C=T+4
929 IF A(R,C)=0 THEN GOTO 145
930 GOTO 1060
931 LET R=S-2
932 LET C=T+2
933 IF A(R,C)=0 THEN GOTO 145
934 LET R=S+3
935 LET C=T-3
936 IF A(R,C)=0 THEN GOTO 145
937 GOTO 1060
1000 LET U1=1
1005 POKE 32000,3
1010 POKE 32002,3
1015 POKE 32001,12
1020 RAND USR 16514
1025 LET S1=USR 16514
1030 IF S1=0 THEN GOTO 899
1035 LET B1=INT (S1/256)
1040 LET C1=S1-256*B1
1045 LET S=INT ((161-B1)/15)
1050 LET T=(161-15*S)-B1
1052 IF C1=1 THEN GOTO 910
1054 IF C1=15 THEN GOTO 917
1056 IF C1=16 THEN GOTO 924
1058 IF C1=14 THEN GOTO 931
1060 POKE 31985,(146-B1)
1062 POKE 31986,125
1064 POKE 31987,0
1066 POKE 31988,B1
1068 RAND USR 16650
1070 LET S1=USR 16650
1072 IF U1=1 THEN GOTO 1030
1074 GOTO 905
1076 SAVE "GOBANG"
1077 RUN
1078 REM C*SPICA
```

The ZX81 soft selection

Nick Pearce, our ZX81 expert, passes Judgement on the latest batch of releases.

Rocketman
Software Farm

As regular readers of this column may recall, I was very favourably impressed with Forty-Niner, the first hi-resolution game from Software Farm.

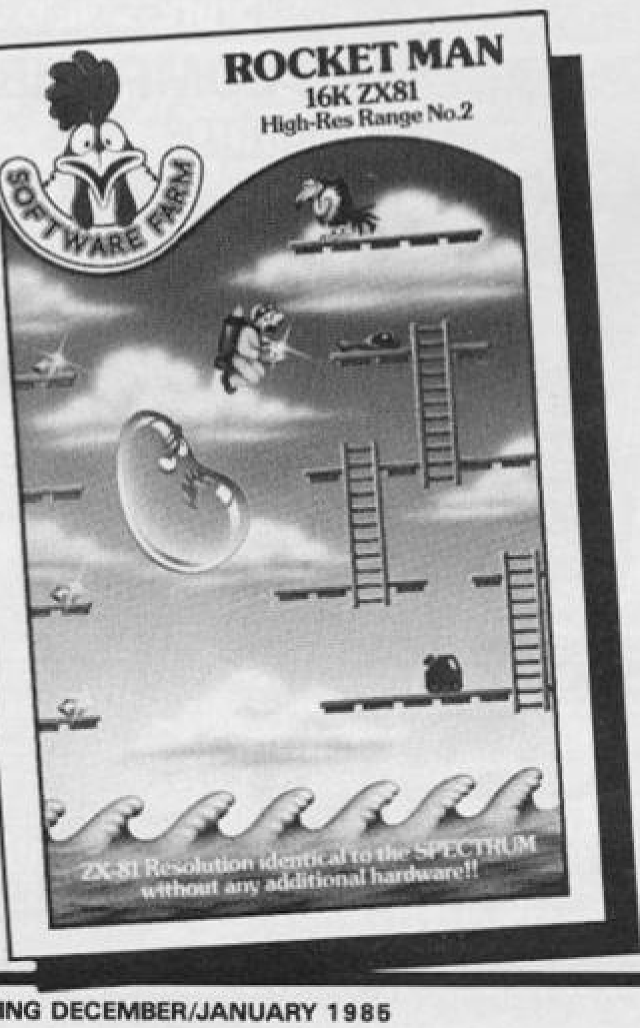
Rocketman is their follow-up, hi-res game and it is even better. Once you're up and running there can be little doubt that you will be transfixed for hours. The game takes time to master, but that doesn't seem to matter at all.

Rocketman is a slightly misleading title. This is **not** a 'star wars' type game. The object is to collect five diamonds which rest on ledges on the left of the screen. Your man starts on the right hand side of the screen on a system of platforms and ladders. You have to hurry round these collecting fuel cans which appear at random positions. Once you have sufficient fuel, you get your rocket and with this strapped to your back fly off across the expanse of sea to the ledges to get those diamonds.

Of course it's not that easy. Any slight misjudgement as you jump from platform to platform and climb up and down the ladders, and you end up in the drink. There is a "bubloid" whose sole object is to chase and catch you. The hi-res display is very good indeed, even down to the realistic splash as you fall to your death in the sea.

If you can get through this first easy (?) section, you are faced with a more difficult stage in which you have to collect enough legs of lamb to feed your vulture in order to fly over to the diamonds. I don't think I've seen a better game for the ZX81. Superb.

Rocketman costs £5.95p from Software Farm, 155 Whiteladies Road, Clifton, Bristol BS8 2RG.



ZOR
J. Till
Canada

I really am being spoilt this time. Another hi-res game to review, and a very good one too. It is the traditional invaders type game, but the graphics are excellent.

The game can be played with either one or two players, and you have five lives per game. The action seemed a little slow at the start of the game, but it speeds up as you progress. The motherships are particularly difficult to hit as they dart across the top of the screen. The only time I successfully destroyed one was whilst it was stationary dropping off an alien to reinforce the attack on my defences. There are five aliens worth from 10 up to 50 points each. Motherships are a good catch, earning you 700 or more points.

As I have already indicated, the graphics display is very good indeed. Not only are the aliens nicely designed but the movement and explosions are good too. Your defender laser even recoils at each firing burst to good effect.

ZOR is an excellent programme and must rank very highly in the ZX81 hall of fame.

ZOR is from J. Till, PO BOX 445, Stratford, Ontario, Canada N5A 6TZ.

Codescan
Ceran Software

Codescan offers a quick and easy method of entering and checking machine code, and will be of interest to those ZX81 users who write complete programs, or subroutines, in machine code.

During use, the screen displays the Codescan operating commands, together with a 'window' showing 24 addresses and their hexadecimal contents, with a cursor pointing to one of the addresses and the contents of the A, BC, DE, and HL registers. The window can be scrolled up or down, and the cursor pointed quickly to any desired address, to enable machine code to be readily compiled and edited. The display and handling methods are excellent in this respect, and make Codescan a very easy-to-use program.

The emphasis throughout, is on user-friendliness. It comes complete with a clearly written instruction booklet, which contains an example program, through which the reader is taken, step-by-step, as an introduction to the facilities offered by Codescan. The program resides above RAMTOP in the ZX81, and so before loading the program, RAMTOP must be lowered.

Apparently, Codescan was developed by Ceran Software as an aid to their own programmers. It is certainly likely to be very attractive to any ZX81 programmer writing in machine code.

A useful and well-presented package.

Ceran Software is at 9 Parliament Road, Thames, Oxon OX9 3TE.

Poolster Treble Chance
Niagram Software

Poolster Treble Chance is a football pools forecasting program for the ZX81.

It does not rely on 'team form' to make predictions, but operates on 'affinity between numbers', the theory being that some pairs of numbers are more compatible than others.

The program incorporates a data base of score-draw results from 6½ league seasons to 1983/84. Niagram claim that weekly updating of this data is not likely to influence the overall predictive ability of the program, therefore you do not have to enter any weekly pools results.

The program aims to produce the 18 most likely score-draws, using two sets of data; a priority table of numbers ranked in a certain order (which can either be random, or according to the program's built-in table, or your own, customised table); and the data-base of score-draw results.

In operation, the program scans the data-base for score-draw sequences and builds up an array of 'select', score draw numbers, with ties between numbers being resolved by the priority listing.

The program works well, and is straightforward to use, coming as it does, with a well-written instruction-sheet. It has

the facility to make hard-copy printouts of the priority-table and the final forecast.

The analysis is time consuming, although there are two modes — fast and slow. In the slow mode, each of the 18 score-draws forecast is displayed as it is calculated, but it takes almost an hour to complete. The fast mode operates at approximately four-times this speed.

Whether ZX81 owners will consider Poolster a worthwhile investment is likely to depend largely upon their amenability to the 'affinity between numbers' theory. Niagram request 10% of any pools win arising through the use of this program, although this is not obligatory. The incentive to do this, is that the user will qualify for the next two updates of Poolster free of charge if he sends them the 10%.

Poolster is avalable by mail-order only. This is because the users name has to be individually encoded into the program as a password, before the package can be sold.

Poolster Treble Chance costs £13 from Niagram Software (Dept. ZX Computing), c/o Soho Synth House, 18a Soho Square, London W1V 5FB.



Gauntlet
Personal Software Services

Gauntlet is an arcade type game. Back to normal ZX81 graphics, but it is quite a good simulation.

The first thing to do after loading is to select from the one or two player options available. In the two player mode, the opponents play alternately and separate scores are held.

The object is to complete successive bombing runs over enemy territory. The terrain is mountainous, and the ground bristles with enemy guns and rockets; and of course, you are constantly shot at as you fly overhead.

You have bombs and missiles to defend yourself. You have to destroy fuel dumps occasionally to maintain enough fuel to continue your mission.

Six phases complete the game. The scenario is the same each time the game is played, so as you become more experienced and develop tactics to cope with each phase a long game with a high score is possible. The action is reasonably good, you can move diagonally as well as up forwards, backwards and up and down.

The company claim that the speed of Gauntlet has been carefully selected to match the arcade game it simulates. I thought it perhaps a little slow but it is possible to speed it up using certain POKE commands.

Gauntlet is a good game, and a reasonable buy.

Gauntlet costs £4.95p. Personal Software Services is at 452 Stoney Stanton Road, Coventry CV6 5DG.

Haunted House

Play P Chauhan's game — if you can — and really give yourself the shivers.



OK. So I did say there was no such thing as a ghost!
OK. So I did agree to spend the night in the infamous Sincrail Manor.
OK. So now HELP!!!

I'm stuck in the maze of rooms with no way of seeing where to go, all I have is six matches will will illuminate the whole house briefly and two ghosts which I must get past. The darn ghosts will chase me as soon as they spot me and are in the way of the exit, perhaps I can lure them out of the way — if only I can remember the right way to go!

On top of all this my old ticker will only stand 5 meetings before I join the ranks of the undead, so what else can I say but HELPPPPPP!!!

```
   1 REM ***********************
         *Underlined characters*
         *are entered in       *
         *GRAPHICS mode.       *
         ***********************
   5 GO SUB 3000
  10 BORDER 0: PAPER 0: INK 7: C
LS
  20 PRINT AT 3,10; INK 6; PAPER
 2;"HAUNTED HOUSE";AT 5,12; PAPE
R 1;"BY P.CHAUHAN": BEEP .2,10:
BEEP .3,12: BEEP .3,14: BEEP .2,
12: BEEP .3,10: BEEP .2,12
  30 PRINT AT 17,4; FLASH 1;"Pre
ss any key"
  40 PAUSE 0: BEEP .2,20: CLS
  50 PRINT  INK 3; FLASH 1;AT 0,
8;"INSTRUCTIONS"
  60 PRINT : PRINT  INK 4;"  You
 are in a haunted house": PRINT
 INK 4;"and you have to get to t
he exit."
  70 PRINT  INK 4;"There are 2 g
hosts lurking about": PRINT  INK
 4;"and if they see you they wil
l   chase you."
  83 PRINT  INK 5;"If they catch
 you then you will": PRINT  INK
5;"lose a life."
  85 PRINT  INK 5;"To make it ha
rder the maze will be invisible
so beware."
  90 PRINT AT 13,6;"^=EXIT  S=TH
E START": PRINT AT 16,6; INK 6;"
G=YOU   B=GHOST"
 100 PRINT AT 21,19; INK 5; FLAS
H 1;"Press any key"
 140 PAUSE 0: BEEP .2,20: CLS
 150 PRINT AT 3,11; INK 4; FLASH
 1;"**Keys**"
 160 PRINT AT 5,8;"'W'-TO MOVE U
P"
 170 PRINT AT 7,8;"'S'-TO MOVE D
OWN"
 180 PRINT AT 9,8;"'J'-TO MOVE L
EFT"
 190 PRINT AT 11,8;"'K'-TO MOVE
RIGHT"
```

```
200 PRINT AT 14,0; INK 5;"If ke
y 5 is pressed then you can": PR
INT  INK 5;"see where you are in
 the maze."
205 PRINT  INK 5;"You can only
press key 5 six": PRINT  INK 5;"
times so don't waste it!!!"
210 PRINT AT 20,2; FLASH 1;"Pre
ss any key"
220 PAUSE 0: BEEP .2,20: CLS
300 DIM A$(20,25)
310 LET A$(1)="█^███████████████
████████"
320 LET A$(2)="██ ███  ██    ██
██  ███"
330 LET A$(3)="██        █████ ██
████ ████"
340 LET A$(4)="███ ███████
    ███"
350 LET A$(5)="██        █████ █
█ ███  █"
360 LET A$(6)="█████ ████
██ █ █ ██"
370 LET A$(7)="█          ██ ████
█ █     █"
380 LET A$(8)="█ ████ ██  ████
█ ██ ███"
390 LET A$(9)="█          ██ █████
  █  █ █"
400 LET A$(10)="█████ ██  ██  █
██  ██ █ █"
410 LET A$(11)="█████ ███ ███
██ ███ █ █"
420 LET A$(12)="████         ██
      █"
430 LET A$(13)="█ ████████ ██ █
█ ███    █"
440 LET A$(14)="█        ██   █
  ██████ █"
450 LET A$(15)="█████ ████████ ██
█    ███ █"
460 LET A$(16)="████    ██████
█████  █ █"
470 LET A$(17)="██ █ ███    ██
██ ██    █"
480 LET A$(18)="██████    ███ ██
██  █  ███"
490 LET A$(19)="█████
       S█"
500 LET A$(20)="████████████████
██████████"
550 LET c=19: LET d=22: LET r=5
: LET w=0
560 LET g=10: LET h=10
570 LET x=4: LET y=4: GO TO 600
590 FOR q=20 TO 0 STEP -1: BEEP
 .1,q: NEXT q: IF r=0 THEN  FOR
f=0 TO 100: NEXT f: GO TO 2000
600 CLS : PRINT ': FOR T=1 TO 2
0: PRINT  INK 2;" ";A$(T): NEXT
T: PRINT AT 8,26;"THE";AT 9,27;"
MAZE": PRINT AT c,d;"G": FOR T=0
 TO 250: NEXT T: CLS : PRINT ':
FOR T=1 TO 20: PRINT  INK 0;" ";
A$(T): NEXT T
602 PRINT AT 6,26;"Maze";AT 8,2
6;"seen";AT 10,29;w;AT 12,26;"Ti
mes"
604 PRINT AT 1,3;"^": PRINT AT
19,24;"S"
605 PRINT AT 0,27;"Lives";AT 1,
29;r
606 LET X$="G"
610 LET A$(c,d)=" "
620 IF INKEY$="" THEN  GO TO 66
0
630 IF INKEY$="w" AND a$(c-1,d)
<>"█" THEN  LET c=c-1: BEEP .02,
10: IF c=1 AND d=3 THEN  GO TO 1
000
640 IF INKEY$="s" AND A$(c+1,d)
<>"█" THEN  LET c=c+1: BEEP .02,
10
650 IF INKEY$="j" AND A$(c,d-1)
<>"█" THEN  LET d=d-1: BEEP .02,
10
655 IF INKEY$="5" AND w<6 THEN
 LET w=w+1: GO TO 600
660 IF INKEY$="k" AND A$(c,d+1)
<>"█" THEN  LET d=d+1: BEEP .02,
10
670 PRINT  INK 5;AT c,d;"G"
680 IF A$(c-1,d)<>"█" THEN  PRI
NT AT c-1,d;" "
690 IF A$(c+1,d)<>"█" THEN  PRI
NT AT c+1,d;" "
700 IF A$(c,d-1)<>"█" THEN  PRI
NT AT c,d-1;" "
710 IF A$(c,d+1)<>"█" THEN  PRI
NT AT c,d+1;" "
720 PRINT AT g,h;a$(g,h): IF IN
T (RND*2)+(G>C) AND a$(g-1,h)<>"
█" THEN  LET g=g-1
730 IF INT (RND*2)+(G<C) AND a$
(g+1,h)<>"█" THEN  LET g=g+1
740 IF INT (RND*2)+(H>D) AND a$
(g,h-1)<>"█" THEN  LET h=h-1
750 IF INT (RND*2)+(H<D) AND a$
(g,h+1)<>"█" THEN  LET h=h+1
760 PRINT AT g,h; INK 4;"B"
770 IF g=c AND h=d THEN  LET r=
r-1: LET c=19: LET d=22: LET x=4
: LET y=4: LET g=10: LET h=10: G
O TO 590
780 PRINT AT x,y;a$(x,y): IF IN
T (RND*2)+(X>C) AND a$(x-1,y)<>"
█" THEN  LET x=x-1
790 IF INT (RND*2)+(X<C) AND a$
```

```
(x+1,y)<>"■" THEN LET x=x+1
 800 IF INT (RND*2)+(Y>D) AND a$
(x,y-1)<>"■" THEN LET y=y-1
 810 IF INT (RND*2)+(Y<D) AND a$
(x,y+1)<>"■" THEN LET y=y+1
 820 PRINT AT x,y; INK 2;"B"
 830 IF x=c AND y=d THEN LET r=
r-1: LET c=19: LET d=22: LET x=4
: LET y=4: LET g=10: LET h=10: G
O TO 590
 900 GO TO 610
1000 CLS : PRINT AT 1,10; INK 6;
 PAPER 1; FLASH 1;"WELL DONE!":
FOR F=0 TO 20: BEEP .2,F: NEXT F
1010 PRINT : PRINT  INK 6;"EASY
WASN'T IT.BUT NOW I BET YOU": PR
INT : PRINT  INK 6;"CAN'T DO IT
AGAIN.PROVE ME WRONG"
1020 PRINT : PRINT  INK 5;AT 7,5
;"Have Another Game"
1030 PRINT AT 9,12;"(Y/N)"
1040 IF INKEY$="Y" OR INKEY$="y"
 THEN  CLS : GO TO 550
1050 IF INKEY$="n" OR INKEY$="N"
 THEN  CLS : PRINT AT 10,2; INK
6;"HOPE YOU ENJOYED THE GAME!":
FOR F=20 TO 0 STEP -1: BEEP .4,F
: NEXT F: STOP
1060 GO TO 1040
2000 CLS : PRINT AT 3,1; INK 7;
PAPER 2;"SORRY,YOU LOST ALL YOUR
 LIVES."
2010 BEEP .5,14: BEEP .5,14: BEE
P .6,12: BEEP .6,10: BEEP .6,12:
 BEEP .5,14: BEEP .8,12
2020 PRINT AT 6,0;"BUT YOU COULD
 STILL HAVE ANOTHER": PRINT : PR
INT "       GO IF YOU WANT TO."
2030 PRINT  INK 5;AT 10,12;"(Y/N
)"
2040 IF INKEY$="" THEN  GO TO 20
40
2050 IF INKEY$="Y" OR INKEY$="y"
 THEN  CLS : GO TO 550
2060 IF INKEY$="N" OR INKEY$="n"
 THEN  GO TO 1050
2070 GO TO 2040
3000 FOR N=0 TO 7
3010 READ A: POKE USR "A"+N,A: N
EXT N
3020 DATA 60,126,126,219,255,255
,255,219
3030 FOR N=0 TO 7
3040 READ O: POKE USR "G"+N,O: N
EXT N
3050 DATA 24,24,126,90,24,60,36,
102
3060 RETURN
```

Portability 3

Peter Moore in conjunction with Newtech (Micro) Developments Ltd. describes the design and construction of an RS232 interface for the Spectrum/ZX81

In this issue we bring you an RS232 serial in/out port and 8 bit parallel output port. The RS232 port has a range of Baud rates which can be selected for data transmission and reception. It can be used to drive a printer with an RS232 input or to enable your computer to communicate with other computers etc.

An eight bit output which can be used to drive a Centronics parallel printer is also provided on the board.

The problem — TTL signal levels

The TTL standard requires a signal of at least 2.5 volts for logic 1 and not more than 0.7 volts for logic 0 at the point of origin. This is fine where signals are only taken over short distances, but when a signal is to be taken over any distance (by cable) a drop in voltage will be experienced. In addition, the interlead capacitance of a length of cable can be sufficient to impede the very rapid cycling of a high frequency signal. Computer printers with a serial input generally expect a logic 0 signal of less than — (minus) 3 volts and a logic 1 signal of at least + 3 volts. When driven by a TTL signal they will tend to make printing errors.

The answer — RS232 signal levels

The RS232 standard specifies that at the point of origin, a logic 1 signal will be + 12 volts and a logic 0 signal will be − 12 volts. A printer receiving an RS232 signal, however, does not look for + and − 12 volts. For example, the Brother HR5 printer accepts a voltage of −3 volts or less as logic 0 and +3 volts or more as logic 1. So long as, by the time the signal reaches the printer, the signal complies with these requirements, the printer will receive and print the data without corruption (ie. printing errors). The RS232 standard enables longer printer cables to be used since a much greater voltage drop is allowable with an RS232 signal than with a TTL signal. In addition, the higher voltages used by the RS232 standard diminish the effect of interlead capacitance.

Unlike many other commercially available RS232 interfaces for the ZX81 and Spectrum, this interface attempts to meet the RS232 standard by supplying −9 volts for logic 0 and +9 volts for logic 1. The serial input allows for similar voltages to be catered for.

Construction

All the components used inthis project are mounted on a single-sided Printed Circuit Board (PCB). Look at Fig.1, this is the PCB overlay which shows where each component is located.

NOTE that there are three links *under* IC1. You will probably find it easier to solder these onto the copper side of the PCB using insulated wire. You should also use insulated wire where there is any possibility that a link may short to another component. The four links next to IC4 are used to set the Baud rate (ie. number of data bits per second) of the RS232 input and output ports; do not solder these on yet, they are dealt with later on.

Take care when soldering the flying leads/links between SK1, IC3 and IC6; use insulated wire as they carry +9 volts which must not be allowed to come into contact with any other components leads or PCB tracks.

Aside from the four links next to IC4, there are thirteen links to be soldered; solder these in first.

Next solder in the IC sockets, one at a time, taking care that no solder is allowed to bridge across any of the tracks on the PCB. Be very patient when inserting the 40 pin socket for ICI, making sure that all 40 pins have come through their holes before soldering any of them.

Solder the voltage regulator Reg. 1 in position. This large metal and plastic cased component has three leads; it *must* be soldered the right way round. Mount it so that the flat all metal side *faces* SKI. (See Fig.2).

C1 and C2 are miniature electrolytic capacitors. These small, round black components *must* be mounted the right way round. Their leads will be marked + and/or — so check Fig. 1 to make sure you have them the right way round before soldering them in. C3 and C4 are 56pf mica capacitors. These flat, dark brown components can be mounted either way round.

C5 is a 220uf electrolytic capacitor. It *must* be mounted the right way round. Like C1 and C2 its leads will be marked. The positive (+) lead is the one *nearest* IC1.

Capacitors C6, C7 and C8 are 0.1uf components (the ones supplied in the kit are bright orange). Solder them in the positions shown in Fig.1. They can be mounted either way round.

Resistor R1 is a small tubular component with coloured bands

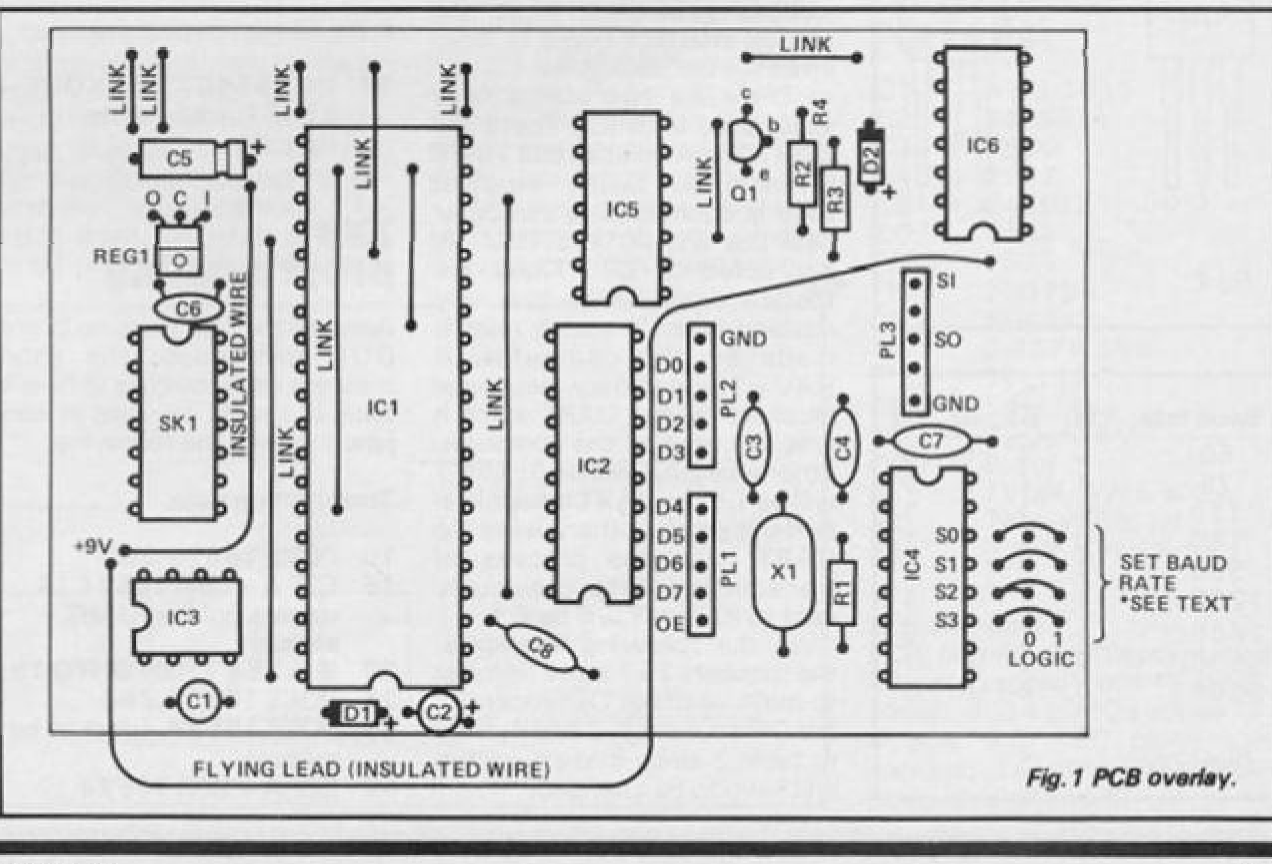


Fig. 1 PCB overlay.

Brown, Black, Blue. R2 has coloured bands Brown, Black, Red; R3 is marked Orange, Orange, Brown. Solder these resistors in their correct positions on the PCB. They can be mounted either way round.

Diodes D1 and D2 are tiny, glass cased components with a black band near one lead; this band marks the Cathode or negative (−) lead. D1 is located at the top of ICl; its Cathode is the lead *furthest away from* C2. D2 is located next to IC6. Its Cathode is the lead *furthest away from* IC4. Solder in these two diodes making sure you have them the right way round.

Transistor TR1 is a small three-lead component in a black plastic case. (See Fig.1). Its leads are labelled E (Emitter) B (Base) and C (Collector). Fig.2 whose the connections of TR1. You must make sure that you mount this component the right way round. Take care not to allow TR1's leads to short against each other.

Now solder in crystal X1. This is a larger component with two leads which can be mounted either way round.

Finally, solder in the three, five-way 0.1" PC plugs PL1, PL2 and PL3.

Setting the Baud rate

There are pads for four links next to IC4; these are used to select the Baud rate at which the RS232 interface will receive and transmit data, by connecting the S0, S1, S2 and S3 inputs of IC4 to logic 0 (GND) or logic 1 (in this case VCC, +5 volts).

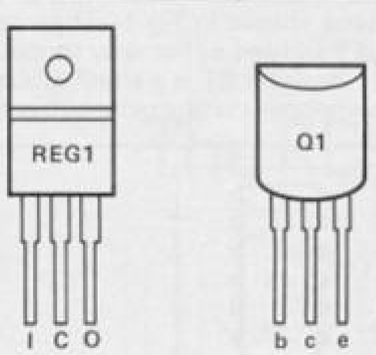


Fig. 2

Baud rate:	S0	S1	S2	S3
50	0	1	0	0
75	1	1	0	0
110	1	1	1	1
150	0	1	1	1
300	1	0	1	1
1200	1	1	0	1
2400	1	1	1	0
4800	1	0	0	1
9600	0	0	0	1

Table 1.

In Fig. 1 these four links are shown connected to give a rate of 1200 Baud. Table 1 gives the connections for alternative Baud rates. Compare Fig. 1 and Table 1 to see how the different Baud rates are selected. 200 Baud is quite fast enough for most purposes. Select the rate you require (this might entail checking your printer's manual) and solder four links accordingly.

Programming the RS232 Board

The RS232 Board connects to the main interface board (published in the Aug/Sept. issue of *ZX Computing*) via a 14 way DIP jumper cabler. This main interface board allows up to four peripheral boards to be connected to your computer and used at the same time.

Depending on which of the four DIP sockets on the main board is used, each of the ports on the RS232 Board (Serial input and output, UART status and 8 bit parallel output) will have a number to identify it. (See table 2).

It is *very* important to ensure that the DIP jumper plugs are the same way round on each board; the wire at the *top* end of the socket on the main interface board must be the wire at the *top* end of SKI on the RS232 board.

We will assume that the DIP jumper cable connects the parallel interface board to main interface DIP socket 1.

There are two status flags associated with ICl. These are DAV (Data Available) and TBMT (Transmitter Buffer Empty). DAV is connected to computer data bus line D0 and TBMT is connected to D7. These are tristate lines which are only enabled when a status read is made by the computer. If DAV=1, new data has been received by the UART since it was last read by the computer, otherwise DAV will be 0. TBMT will be 1 if the UART transmitter buffer is empty, otherwise (if the UART is in the process of transmitting data previously sent to it) TBMT will be 0.

In the following examples, the numbers 253 and 254 refer to main interface DIP socket 1. For DIP sockets 2, 3 and 4, refer to table 2 since these numbers will have to be changed.

Main Interface Socket:	Device No. Serial port.	Status/Parallel Port.
1	254	253
2	251	247
3	191	127
4	239	223

Table 2.

Spectrum programming

Transmitting data

```
10 OUT 65407,253: REM
   select UART status/8 bit
   output port
15 LET A=IN 65471 : IF A
   254 THEN GO TO 15 :
   REM loop if the UART has
   not finished transmitting a
   previous byte of data
20 OUT 65407,254 : REM
   select RS232 in/out ports
25 OUT 65471, (data to be
   output)
```

If A in line 15 equals 254 or 255, then the UART is ready to transmit a further byte of data. (255 if DAV=1, 254 if DAV=0).

Receiving data

```
30 OUT 65407,253: REM
   select UART status/8 bit
   parallel output port
35 LET A= IN 65471 : IF INT
   (A/2)=A/2 THEN GO TO
   35 : REM go to 35 if
   DAV=0 ie. no new data
   has been received
40 OUT 65407,254 : LET
   A=IN 65471 : REM A
   holds the data received by
   the UART
```

8 Bit Parallel Output Port.

```
10 OUT 65407,253 : OUT
   65471, (data to be
   output).
```

ZX81 programming

Because the ZX81 has no IN and OUT commands, the short machine code routines shown in table 3 should be used in conjunction with the following:

Transmitting data.

```
10 POKE 16515,253
15 LET A=USR 16514 (A
   returns holding UART
   status)
20 IF A 254 THEN GOTO 15
25 POKE 16525,254
30 POKE 16529, (data to be
   output)
35 LET A=USR 16524
```

Lines 15 and 20 check that the UART is not still transmitting any previous data.

Receiving data.

```
40 POKE 16515,253
45 LET A=USR 16514 (A
   returns holding UART
   status)
50 IF INT (A/2)=A/2 THEN
   GOTO 45 (no new data
   received yet)
55 POKE 16515,254
60 LET A=USR 16514 (A
   holds the data just receiv-
   ed)
```

8 Bit Parallel Output Port.

```
10 POKE 16525,253
15 POKE 16529, (data to be
   output)
20 LET A=USR 16524
```

Connecting the RS232 interface to other equipment

PL3 is the connector used for serial data input and output signals. To check that your RS232 Board is working properly, connect it up to your computer (with the computer switched OFF) and join the SO (Serial Out) and SI (Serial In) lines at PL3 directly together. If you now output data to the serial output port you should find that it appears at the serial input port.

Remove the link between SO and SI.

An RS232 serial output line is generlly referred to as TX (Transmitted data) while an input line is RX (Received data). If you wish to connect your RS232 board to a printer, you should connect SO on your board to the RX connection on your printer. GND (OV) must also be connected. (GND is taken to PL3 along with SO and SI).

You must bear in mind that our computer can output data through this RS232 interface much faster than your printer can print it; most computer printers incorporate a buffer which stores the characters sent to the printer: if your printer prints a whole line at a time, rather than one character at a

```
 1 REM XXXXXXXXXXXXXXXXXXXReserve 19 Bytes
10 FOR F=16514 TO 16532
15 INPUT A
20 POKE F,A
25 NEXT F
```

Address	Data (Decimal)		
16514	62	LD A,n	Entry point for input serial data/status
16515	00		POKEd, 253 to read status, 254 to read data
16516	211	Out (n),A	
16517	127	n	
16518	6	LD B,n	
16519	0	n	Clear B
16520	219	In A,(n)	
16521	191	n	
16522	79	LD C,A	BC = 00dd where dd is the byte just input
16523	201	RET	
16524	62	LD A,n	Entry point for data output
16525	00	POKEd 253	to output to 8 bit parallel port, 254 for serial o/p
16526	211	OUT (n),A	
16527	127	n	
16528	62	LD A,(n)	
16529	00	n	Data to be output
16530	211	OUT(n),A	
16531	191	n	
16532	201	RET	

Table 3.

time, then it has a buffer. Even so, you may find that you have to slow your computer program down (using, for example,. PAUSE statements) if it is continuously outputting a lot of text.

Your printer may have a ready line or equivalent, which indicates when the printer can receive more data. You could use on bit of one of the parallel ports provided in the parallel in/out board published in the last issue to read such a status line from your printer. In the event that your printer's ready line complies with the RS232 standard rather than the TTL standard, you would need to use a circuit like that in Fig. 3 to limit the signal to TTL levels. In practice, a ready signal from a computer printer is not essential.

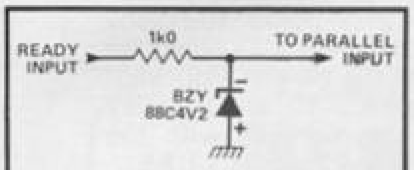


Fig. 3.

8 Bit output port connections

0.1" PC plugs PL1 and PL2 are used for connections to the 8 bit parallel output port (See Fig.4).

GND and $\overline{OE}$ (Output Enable) are also brought out to these plugs. When $\overline{OE}$ is at logic 1 or simply not connected, the eight output lines D0 to D7 are in a high impedance state disabled (ie. effectively non existent). To enable them, $\overline{OE}$ must be connected to logic 0 (ie. OV/GND).

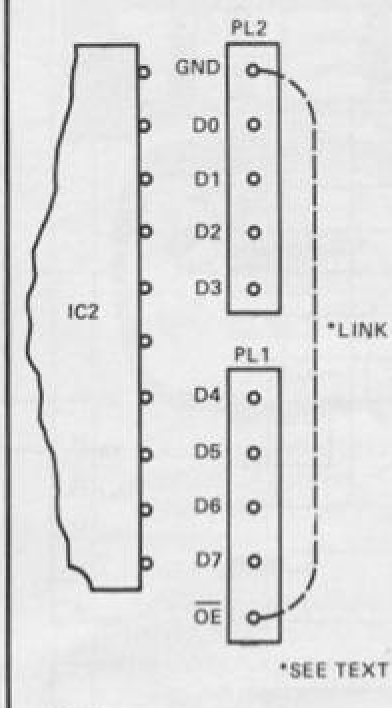


Fig. 4.

You can, if you wish, simply take a wire link between $\overline{OE}$ and GND so that the outputs are permanently enabled; we have left $\overline{OE}$ unconnected since you may wish to drive it from an external (TTL logic) signal.

This eight bit output port could be used to drive a printer with a Centronics parallel interface; pin 11 (CP) of IC2 is pulsed with a signal which could be used as a negative strobe. You could take a wire from this pin to supply the required strobe signal for your printer. Alternatively, the port could be used to light LEDs (Light Emitting Diodes) etc.

Circuit description

IC1 is a UART (Universal Asynchronous Receiver/Transmitter), the big 40 pin chip which does nearly all the hard work. (See Figs. 6a, 6b and 6c).

The output half of IC1 (See Fig.7) accepts a byte of data from your computer and outputs it in a serial form, one bit at a time, adding one start and two stop bits to each byte (See Fig.5). Data from the serial output (SO) of IC1 goes to IC6, an RS232 line driver IC, which converts the signal from its TTL form to a signal which has approximately −9V as logic 0 and +9V as logic 1. IC6 also inverts the signal as required by the RS232 standard (ie. changes every 0 to a 1 and every 1 to a 0).

Transistor TR1 and resistors R2 and R3 invert the signal appearing at the serial input on the RS232 board, converting it into a form (at TTL levels) which can be read by the input half of IC1. Diode D1 ensures that the most negative voltage at the base of TR1 cannot be more negative than 0.6 volts.

IC1 needs a clock signal at a frequency which is sixteen times the required Baud rate. This is provided by IC4 which is a programmable Baud rate generator (Fig. 6c). Crystal X1 is used to keep the frequency of oscillation constant. The Baud rate is selected by means of four links on the PCB next to IC4.

IC3 is a voltage converter (Fig. 6b) powered from the +9 volt line. This IC, in conjunction with C1, C2 and D2, provides the −9 volts required by IC6.

IC2 is an actual (eight way) tristate latch, used to provide an eight bit output port. (Fig.6c). Data written to this port remains set until changed.

Reg. 1 is a fixed voltage regulator which provides a regulated 5 volt line from the 9 volts supplied through SK1.

Fig. 8 shows the copper foil pattern of the PCB.

Parts list

IC1	AY-3-1015
IC2	74LS374
IC3	7660
IC4	4702
IC5	74LS32
IC6	1488
REG.1	7805
TR1	2N3704
D1,2	1N4148
X1	2.4576 MHz
C1,2	10uf 15C
C3,4	56pf Mica
C5	220uf 16V
C6,7,8	0.1uf
R1	10MR ⅓W 5% tol.
R2	1K ⅓W 5% tol.
R3	330R ⅓W 5% tol.

Miscellaneous:
PCB, one 40 pin IC socket, one 20 pin IC socket, one 16 pin IC socket, 2, 14 pin IC sockets, 3, 5 way 0.2" PC plugs and sockets, 14 way DIP jumper cable (double ended).

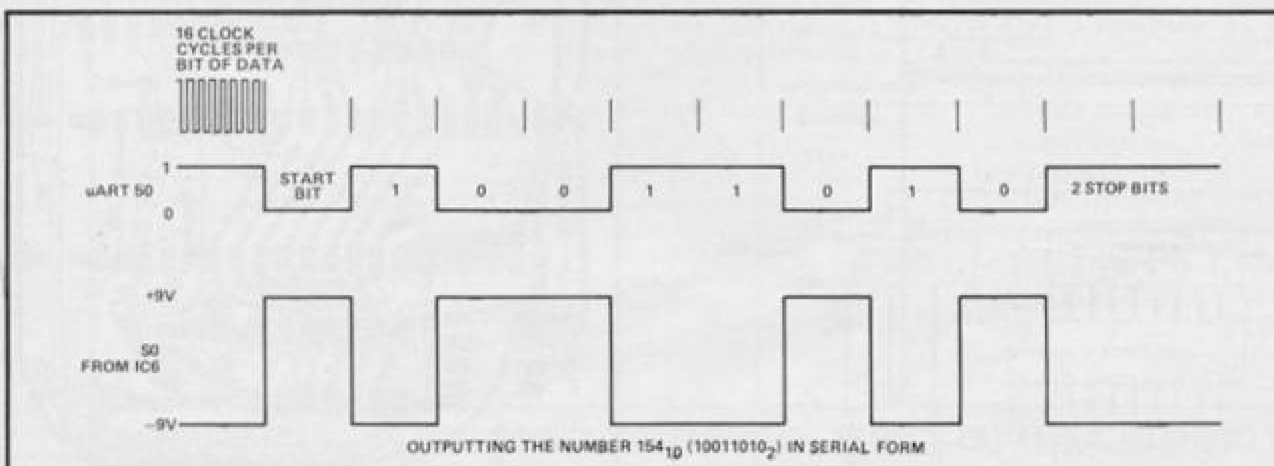


Fig. 5.

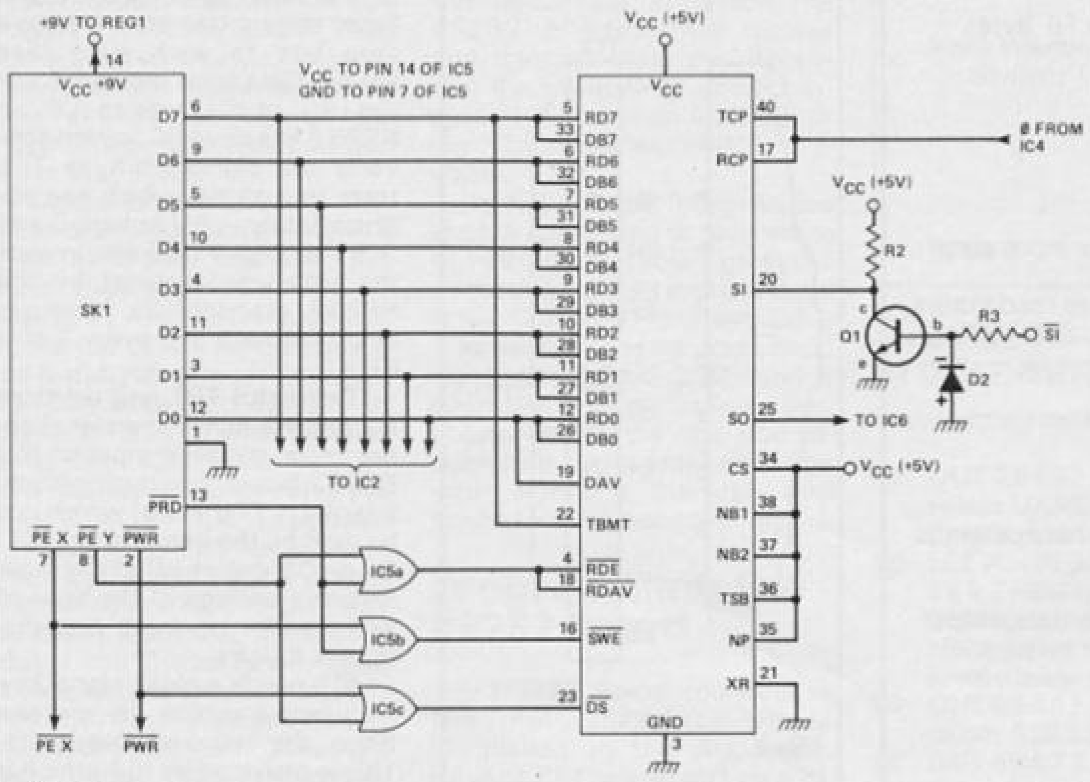


Fig.6a.

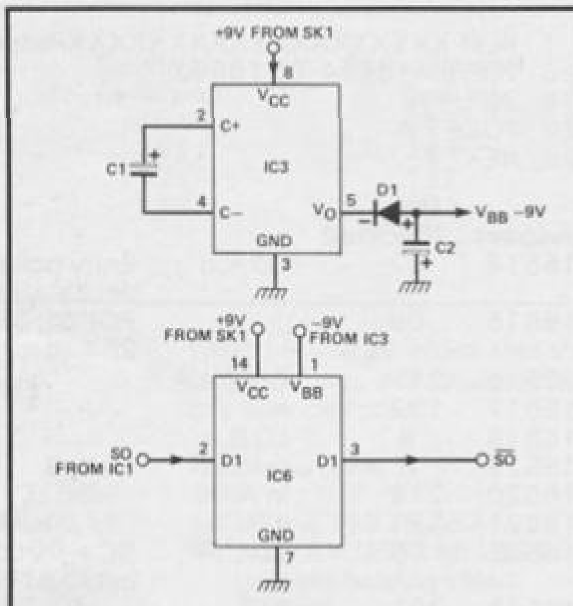


Fig.6b.

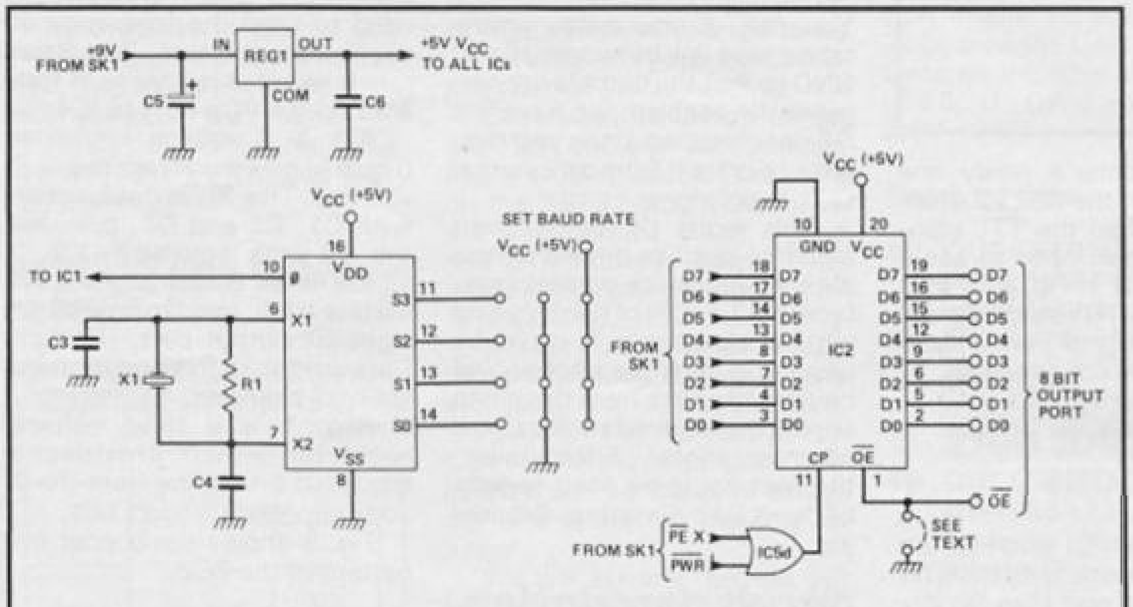


Fig.6c.

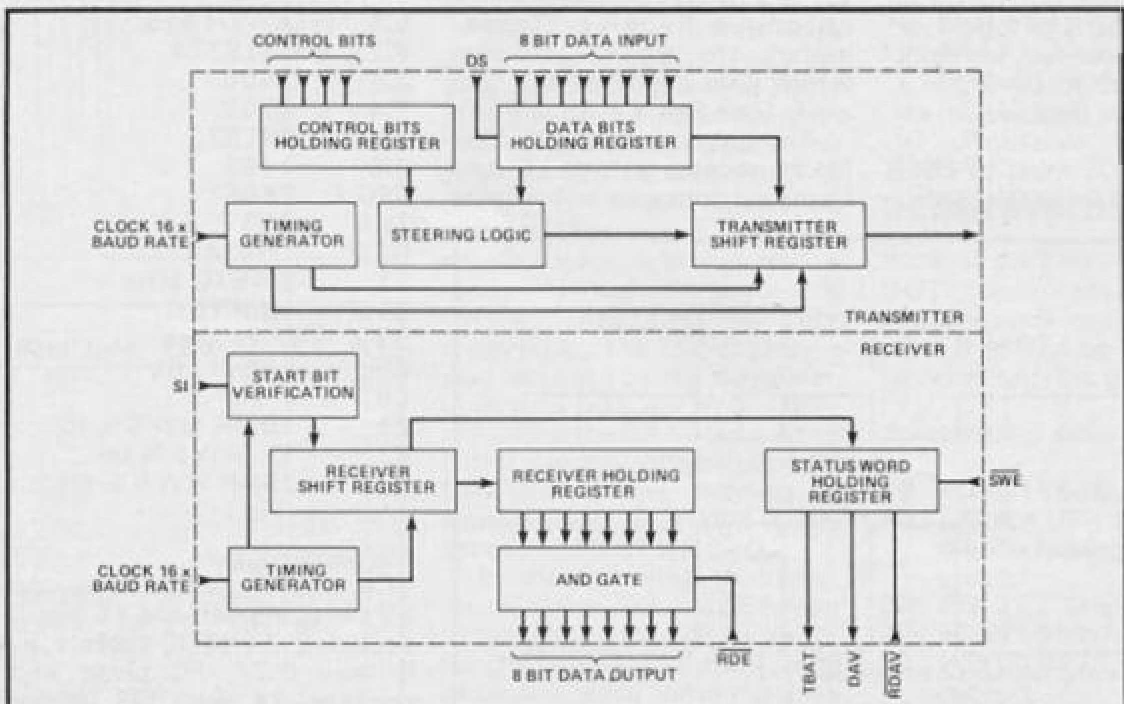


Fig.7.

Buylines

A complete kit of parts for the RS232 Board is available from Newtech (Micro) Developments for £26.95 all inclusive. DIP jumper cables are *not* included in the kit and must be purchased separately, they cost £3.85. Newtech also supply kits for the main interface board (Aug/Sept issue) for £11.95; the parallel input/output board (Oct/Nov issue, £14.95), LED board for use with the parallel input/output board (£2.50) and the relay board, also for use with the parallel in/out board (£11.95).

Further details are available from them at 1, Courtlands Road, Newton Abbot, Devon TQ12 2JA. Tel. (0626) 62836.

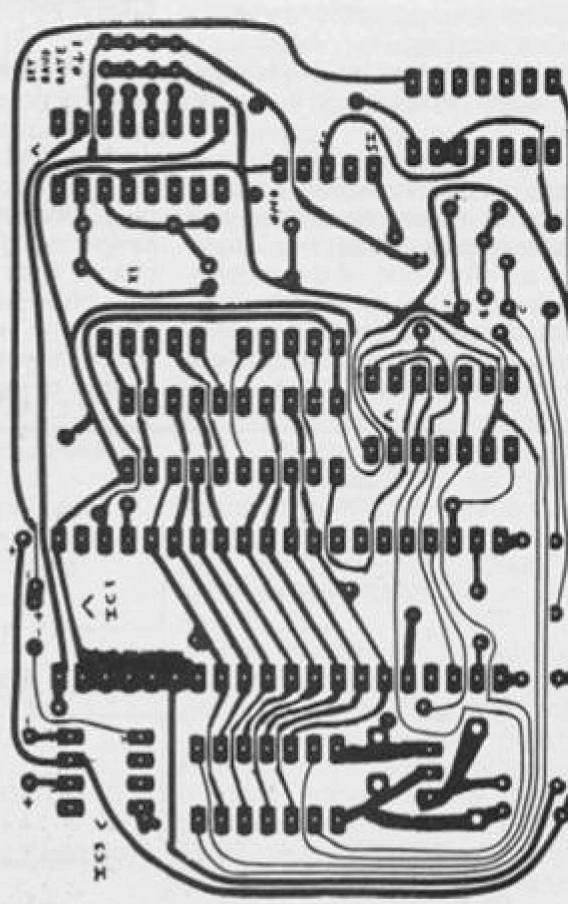


Fig.8.

Bookshelf

Patrick Cain settles down a good (?) read.

The Easy Way To Program Your New Computer Tim Hartnell

There was a time I was naive enough to think people wrote books only because they had something worthwhile to say. Perhaps at a later time in life I will understand why people write books only for other reasons. Until then it baffles me why Tim Hartnell has released, 'The Easy Way to Program Your New Computer', Interface Publications, for in it Tim has nothing to say that he hasn't already said more effectively many times before.

As the title suggests the book is not intended for any computer in particular rather it is a general approach to the BASIC language, or part of it for although many of BASIC's commands are covered some are gapingly amiss which makes it rather surprising to find out later that their use is highly recommended. The approach of the text to each command explained can less not be faulted: the method of description and example is sound and Tim uses the technique well "to make complex subjects easy to understand", come on though, Tim, isn't there a more logical example than 'THE US OF A No.1' to explain a FOR. . . . NEXT loop. Yes it confused me too.

Instead of being close on two hundred pages of useful advice on understanding programming this book is half of that with a further one hundred pages of interesting but mostly useless info on computers. The lack of an index makes finding the worthy parts even harder. And that is the real pity for with over 30 books already to his credit the author has many useful things to say about computers and programming.I only wish he had waited until he had enough for an entire book.

'The Easy Way To Program Your New Computer' is written by Tim Hartnell and published by Interface.

ISBN 0 907563 60 0.

Understanding Computer Graphics Judy Tatchell Les Howarth

There can be few areas, if any, of computer development whose application is so widespread as computer graphics. Yet, perhaps, it is because of the advancement in this area that we overlook or are unaware of many of the applications. As everybody knows, the Walt Disney studios used computer graphics extensively in the film 'Tron'. Computer graphics are used more and more in film production, as they are in television, cartoons, painting, sculpture and other art forms; but their application spreads far beyond these. Readers of 'Understanding Computer Graphics' by Judy Tatchell and Les Howarth are quickly put in the picture about a variety of applications.

As with the rest of the books in the series the publishers have gone to some length to support the text with many bright illustrations. Indeed the format resembles a comic book with illustrations and text being freely mixed and the maxim of one picture being worth a thousand words is well proven. As a result many complicated notions are expressed in a fashion that is equally suitable for younger and older readers. The discussion throughout the book is non technical, being less concerned with an analysis of computer graphics than with highlighting the varied application. By the time the reader has gone through the 48 pages he will be aware of a number of everyday uses and the principles behind them.

The book is a worthwhile read at a number of levels; it should help to answer in part the ever recurring question "what do computers really do"; it will give computer users an appreciation of other computing areas and it may serve to whet the appetite for further knowledge sated only slightly by the few program examples at the back.

What the book did for me was to quickly draw me a picture of a lot of computer applications I may have missed altogether because I would never have been sufficiently curious to spend sufficient time to look. And for that alone it was a valuable read.

'Understanding Computer Graphics' is written by J. Tatchell and L. Howarth.

ISBN 0 86020 739 0



Programming With Graphics Garry Marshall

"For my money the graphics capability of a microcomputer is usually its most attractive feature" — Garry Marshall. I would put my money with Mr Marshall as far as the most attractive feature of a microcomputer goes. Most people — I would guess — are attracted to home computing by the graphics potential. It would follow that a book dedicated to graphics programming is likely to be of interest to many, perhaps too many for the text is not specific to any one machine: strange, given that "there is almost total lack of standardisation in the way that graphics facilities are provided by microcomputers". Is then the "great advantage over most books on this subject of being machine independent" an advantage more to Mr. Marshall than the reader?

A strange contradiction; but stop being an old cynic, Cain, get inside further and see what the book's about.

Chapters 1 and 2 introduce and explain how the three graphic display types — block, pixel and line graphics — are produced and what their requirements on the computer system are. Three chapters are dedicated to each type of display give a general, but easily understood, account of resolution, movement, shapes, magnification and reduction, lines, curves, squares and 3D graphics. A sixth chapter deals further with the subject of 3D, turtle graphics and speaks on the requirements for a graphics package.

I found the read through the 100 or so pages informative and enjoyable and a lot of light was shed on things I had never before really questioned. The text was clearly written and should offer little problem to the

reader. Each chapter was concluded by a summary. The author has been aware of the mathematical nature of the subject and has made allowances so that seldom is a familiarity with maths beyond school level necessary.

Unfortunately, in spite of an appendix that lists the graphics facilities present on most popular home micros, I still feel that potential readers might best be served by a book aimed at their own machine.

"Programming With Graphics" is published by Granada, written by Garry Marshall and costs £5.95.

Usborne Series

From Usborne Computer Books, a series (there are 12 to date) of, "colourful, straightforward and easy to understand guides to the world of home computing". Each of the books, cost £1.95, is packed from paper cover to paper cover with illustrations that cleverly explain many, otherwise complicated, concepts.

The series ranges from a "Guide to Computers" to "Write Your Own Computer Program". Here is an in depth look at three of the others.

100 Programs For The ZX Spectrum. Ian McLean and John Gordon

There was a time when virtually all computer books had titles like 100 Games For The something or other. I wonder what has happened to them. Has the editor decided to keep those ones for himself now?

If he has then thanks for the favour! Now that one has slipped through his net it is interesting to look at one of the more recent types. Has the absence made my hard heart any fonder?

'Personal Computer Weekly' said of the tape version of the book '100 programs for just over £10 means that none of the programs are marvellous'. This is so. The book price of £6.95 represents better value. Obviously the programs haven't improved any, the economics of the above are still as true; but if there is an advantage to loading programs laboriously from the keyboard rather than from tape it is that to new users there must be some educational spin off in seeing how others program. The programs are not marvellous — true; but they are technically sound and may well act as building blocks or inspiration for other programs.

So what classification can be given to these 100 technically sound programs? There are ten equal sized sections covering games, recreation, business, graphics, science, maths and school, data handling, home use and an introduction to Spectrum's facilities. Some I thought were particularly worthwhile. Bubble and Shell sort are standards that can be used by themselves or as part of other programs. Simpson's rule and others in the maths section are likely to be as much use to most new Spectrum users as a degree in dishwashing. The home section turned up my pet hate, if I ever see a program for a Christmas Card List it will be too soon.

If your need is for a large number of programs the '100 Programs For The ZX Spectrum' should probably do you quite nicely. It is certainly an improvement on many earlier books of that ilk. The programs are all quite short — all suitable for the 16K — but high on technique and application. Aren't long programs made up after all from short ones? Personally I think that as programs some are more worthwhile than others, but as the authors point out, these are sample programs to show what a home computer can be used for.

As a guide to better programming alone I think '100 Programs For The ZX Spectrum' is good value, with the added bonus of some useful programs too.

'100 Programs For The ZX Spectrum' is written by Ian McLean and John Gordon, published by Prentice Hall International and costs £6.95

ISBN 0-13-634766-6:

Inside The Chip H. Davies M. Wharton

An understanding of a microchip is not necessary to use a computer, but I should imagine that most programmers have wondered from time to time what type of magic takes place between input and output to effect this phenomenon which takes up so much of our time. Some will naturally enough have investigated the subject further others will probably have thought the investigation too involved and contented themselves with a niggling curiosity. It is to these people that "Inside The Chip" by H. Davis and M. Wharton readily lends itself.

Like the other books in the series "Inside The Chip" is not intended, nor does it attempt, to be a text book. As the others do, it touches on the main principles of its subject without becoming entangled in an analysis of the practical unit. The book is a journey inside the chip, explaining on the way what the chip is, how it works and describing some of the amazing things it can do. The guides on the journey are a team of micro sized men who draw the readers attention to the different types of chips, what each type is used for and what many of the jargon terms associated with chips mean. The analogy works well.

27 pages on and the reader will have been introduced, in a simplified way, to the electronic theory, discovered how chips are designed, how they are made and how the different types of chips are used. Registers, control circuits, addresses and the microprocessor's clock are all dealt with in the same way. The book is concise, informative and is fun to read. Little effort is required as a result to get this far and many of those niggling queries ought to be by now disappearing or maybe perhaps becoming sufficiently interesting to examine closer.

Part two is less colourful; but nonetheless as interesting as it comes to terms with slightly more involved notions. 'Input and Output', inside the ALU, a simple logic circuit to build, how the ALU does arithmetic, hints on building circuits, each is handled with the same uncomplicated ease as the earlier topics. Certainly not Cambridge research level yet, but sufficient information within the 48 pages to either whet an appetite or satisfy a less inquisitive mind.

Given that you can't read every book, some are too time consuming, some are mostly irrelevant, some are too involved: "Inside the Chip" is perhaps one you should read. Written by H. Davies and M. Wharton "Inside the Chip" is a book that is probably worthy of a glimpse from most people.

ISBN 0 - 86020 - 729-3

Machine Code For Beginners L. Watts M. Wharton

I wish every book on machine code that I have ever read had only 50 pages. That is the number in L. Watts' and M. Wharton's "Machine Code for Beginners" another of the Usborne computer book series. Too often those others have gone at length about Hex numbers and assembly language and registers and addresses. This book mentions all of these things too; but the discussions of each are more abridged and that is perhaps why it doesn't work as well as the others in the series. Machine code by its nature may require more patient examination and a more thoughtful text. Maybe those other machine code books were lengthier for good reason.

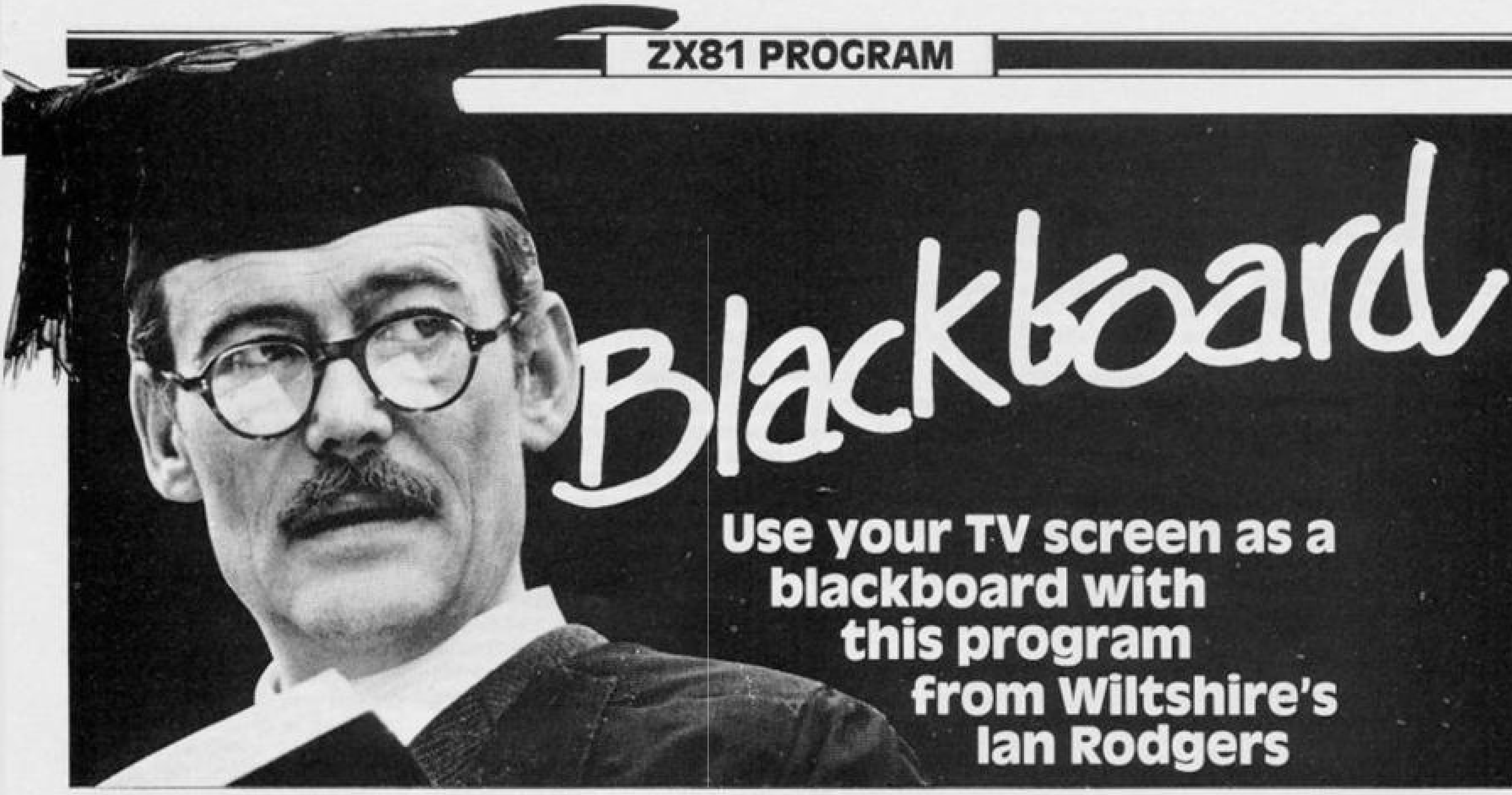
Each of the other two books I have looked at in the series have dealt with topics of general interest, their subjects — the microchip and computer graphics — required a descriptive text not specific analyses therefore the picture book approach was ideal. Machine code however is of such complexity that any discussions handled as above falls far short of an adequate mark. Machine code is for doing and the level of discussion required to teach someone how to do something is far greater than that required to merely describe a subject. This I feel has been overlooked. I should doubt if a text that amounts to a mere description of machine code is sufficient.

The book moves in easy stages through the principles of machine code, showing how to write simple programs — such as adding two numbers — to how to load and run a machine code programme. Both the Z80 and the 6502 processors are catered for. The analogies used to describe the memory supported by the clever illustrations that are the trademark of the series are perhaps the most easily understood I have come across. The sections on PEEKing and POKEing, translating the programs, carry flags, jumping and branching are accurate and are essential to any discussion of this topic. I feel that they are just too concise to effectively explain its complexities.

A study of machine code requires more than clever illustrations. Successful books have dallied with lengthy descriptions of details, giving explanations to account for their occurrence and reinforced the discussions with examples. "Machine Code for Beginners" may be a fun book to read, its colourful pages may help to fill in some background, but it does not have the content of a successful Machine Code reader.

"Machine Code for Beginners" is written by L. Watts and M. Wharton.

ISBN 0 86020 735 8



Blackboard

Use your TV screen as a blackboard with this program from Wiltshire's Ian Rodgers

Ian has produced a neat and comprehensive variation on the "drawing" program in which the screen is inverted and you chalk your pictures on it.

Although not a long program, it needs 16K because the whole screen is used.

Notice how all eight directions are provided plus checking for the screen edges all in TWO lines — 165,170.

Instructions are provided in the program and it's well worth typing in. No more messy chalk dust getting up your nose!

```
   5 CLS
  10 PRINT "DO YOU WANT THE INST
RUCTIONS?   (Y OR N)"
  15 IF INKEY$="Y" THEN GOTO 30
  20 IF INKEY$="N" THEN GOTO 120

  25 GOTO 15
  30 CLS
  35 PRINT "1 TOP LEFT"
  40 PRINT "2 TOP RIGHT"
  45 PRINT "3 BOTTOM RIGHT"
  50 PRINT "4 BOTTOM LEFT"
  55 PRINT "5 LEFT"
  60 PRINT "6 DOWN"
  65 PRINT "7 UP"
  70 PRINT "8 RIGHT"
  75 PRINT "0 RUBOUT-FOLLOWED BY
 DIRECTION      KEY(S)"
  80 PRINT "Q TO STOP RUBOUT"
  85 PRINT "C TO START AGAIN"
  90 PRINT "Z TO STOP CURSOR FLI
CKERING...  FOLLOWED BY:"
  95 PRINT "S TO STOP "
 100 PRINT "R TO CONTINUE"
 105 PRINT
 110 PRINT "ARE YOU READY?"
 115 INPUT A$
 120 LET A$="L"
 125 CLS
 130 FAST
 135 FOR A=1 TO 22
 140 PRINT "████████████████
████████████████"
 145 NEXT A
 150 SLOW
 155 LET A=0
 160 LET B=0
 165 LET A=A+(A<>63 AND (INKEY$=
"2" OR INKEY$="3" OR INKEY$="8")
)-(A<>0 AND (INKEY$="1" OR INKEY
$="4" OR INKEY$="5"))
 170 LET B=B+(B<>43 AND (INKEY$=
"1" OR INKEY$="2" OR INKEY$="7")
)-(B<>0 AND (INKEY$="3" OR INKEY
$="4" OR INKEY$="6"))
 225 IF INKEY$="0" THEN LET A$="
0"
 230 IF INKEY$="Q" THEN LET A$="
L"
 235 IF INKEY$="C" THEN GOTO 125

 240 IF A$="0" THEN GOTO 265
 245 PLOT A,B
 250 UNPLOT A,B
 255 IF INKEY$="Z" THEN GOTO 285

 260 GOTO 165
 265 UNPLOT A,B
 270 PLOT A,B
 275 IF INKEY$="Z" THEN GOTO 285

 280 GOTO 165
 285 IF INKEY$="S" THEN GOTO 300

 290 IF INKEY$="R" THEN GOTO 165

 295 GOTO 285
```

Great Games of '84

Zap-freak Jim Watson looks back at some of the best arcade games of 1984.

Well hi yah folks!
First a few words about the system I'm using to run these proggies on. My Spectrum is linked to a Kempston interface and a Currah Speech unit — How does he run both at once, I hear you cry. Well I got a threeway cable from Classified Product Services Ltd. Shire Hall, The Sands, Appleby in Westmoreland, Cumbria CA16 6XN for £12.50 and hey presto! A bit messy at the back but I'm too busy watching the screen to notice.

To get a good grip I use a Sumcom Tac 2 to really give them nasties some stick. *(Groan — Ed.)*

Sabre Wulf 48K

This has GOT to be the program of the issue, wow what graphics! OK, so its the same sort of theme to Atic Atac but with 256 locations instead of around 150 and it's set in a jungle instead of a house.

Some of those beasties are really something! I loved the Hippos and the De-orientation Orchids really freaked me out, I could almost forgive them for charging £9.95 for it.

Joystick options for Kempston, Interface II or cursor keys are provided as well as using the keyboard. Keys QWERT control left, right, down, up and fight. A bit close together and a strange combination but fairly easy to get used to, although I reckon a joystick is a must for this game.

So what's it all about? You, an intrepid explorer, have to wander the forest in search of the four parts of an amulet before escaping from the a-mazing jungle. Many other items such as a chalice, gems and magic rings are littered about the place and these are collected by passing over them.

The forest teems with wildlife which rush around the screen. Frequently other members of the animal kingdom materialise to add to your problame. To defend yourself you have a sabre, which gives you your nickname "Sabre Man", and your most potent enemies are the Wulves.

Sound is used sparingly but effectively — I liked the intro tune, but it only plays once each time you get back to the menu screen.

Scoring is in two forms, the standard numerical score and also a percentage of the game completed. A high score chart is not used, only the highest score of the session is kept, and no name either! This high score is initially set at 102275, so it takes a few plays to establish your own. An option for one player or two players playing alternately is also provided.

Animation (or should I say animalation ?) is superb. Watch how you are thrown across the screen when a beastie gets you! Not a game for those who give up easily.

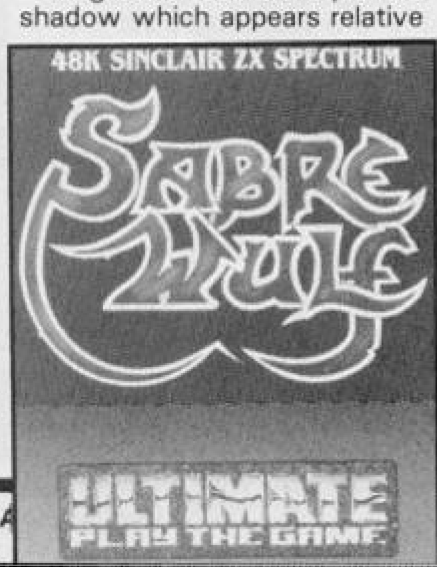
So go get it, load up and be ready to run, dodge, fight and generally have a frantically great time!

TLL (Tornado Low Level)

Nice one Vortex!

A neat flying game, but not a flight simulator I hasten to add, where you control a little swing-wing Tornado fighter plane. You see the plan on screen and the scenery, land, city and sea, is done in a sort of 3D perspective, this tends to be a bit "blocky" but is nonetheless effective.

A great effect is the plane's shadow which appears relative to the plane's height and is your main frame of reference when estimating your height above ground.



Your mission, Biggles, is to destroy targets by flying low over them, not low enough = failure, too low = disaster!

I didn't really find that the joystick made the game appreciably easier, and the keys were easy to use for effective control. It's not easy, in fact quite frequently I found myself going round and round the target until I finally got lined up and then failed to get low enough in time, so I ended going round and round again!

A competent game which would be flyers will love, but somehow for me it seemed to be lacking something. Perhaps if you could have shot or bombed the targets it would have helped.

Hypermania I have **not** got!

Rapscallion

A year ago this would have been hailed as a masterpiece. Now it is only a very good, clever game.

A multi-screen arcade adventure along the Atic Atac lines, the graphics are well done but not outstanding. Sound is good and animation is effective but sometimes a bit jerky.

Actually it's quite addictive. You can get started easily then discover the subtleties as you progress. I found myself trying again and again, perhaps that's the secret of an addictive game, make it look so easy that you KNOW you can do better next time.

The plot is very devious. Rapscallion the Rogue is your enemy and he's nicked your castle and left you chained up in the dungeon. The good fairy (J. Inman?) turns you into a bird of feathered variety and has given you six lives. By sacrificing a life you may transform yourself into a fly. This is needed if you get caught up in the net for instance, and changing back also costs a life. This is a superb touch.

Another ingenious idea is that when you die — a frequent happening at first — you are changed into a ghost and in this form can explore your surroundings with immunity. To continue your quest properly you have to get back to your body and press the character change key.

The game can, and often does, take a long time to play and so, unusual for this type of game, a "Save game" option is provided. However there is a penalty. If you play for a saved game then should you win you only get a leasehold to the castle and not the full deeds!

As I said, a devious game with many facets and I congratulate Bug Byte for the thought which has gone into this game. Although perhaps not as graphically exciting as some other games, the many variations in play and the planning a player has to do makes it one which will last for many many sessions.

The usual keyboard or selection of joystick options (including one usually forgotten — Fuller) is provided, and I found that using a joystick helped to play this game.

Highly recommended!

Jet Set Willy

Manic Miner — The Sequel!

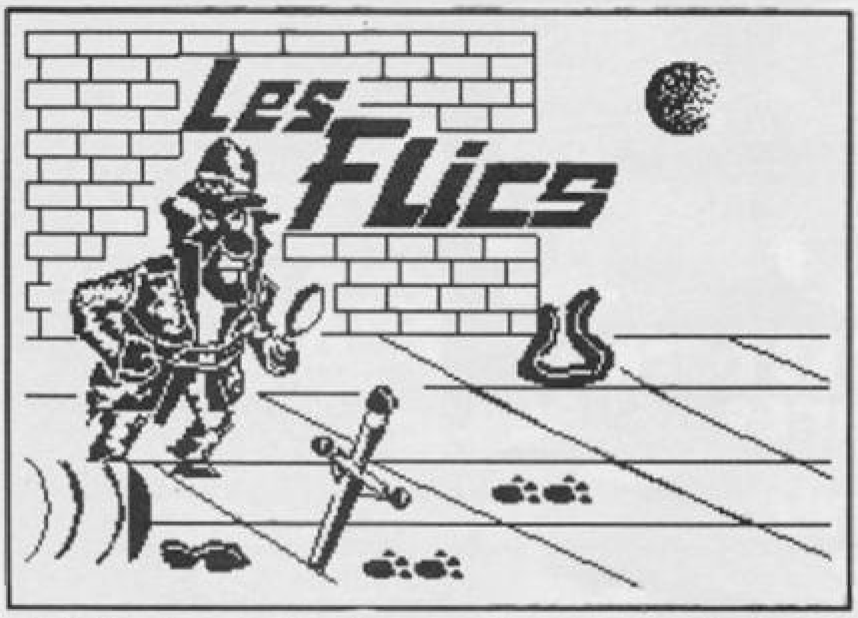
Whereas most cinema sequels are rip offs, this game is as good, and in my opinion, better than the original.

For anyone who has been living in the Sahara desert for the last year as a hermit, Manic Miner was written by Matthew Smith and was the first of a whole new style of game in which the player progressed through several screens of wierd and wonderful creations by making carefully timed jumps from level to level in order to collect various objects.

JSW is the same in outline and again produced from the nightmare mind of Matthew. This time however, the scene is a mansion and JSW has to collect all the glasses left around before he is allowed to go to bed.

Software Projects ran a competition for the first person to tell them how many glasses had to be collected but this has now been won — so no more calls please. For those of you who don't want to know, close your eyes when reading the next bit — there are 83 glasses.

The game has many more rooms to visit, 60 in all, and the manic sense of humour runs through them all, accompanied by a frantic version of "If I were a rich man" guaranteed to drive you bonkers!



The 'ups' are much harder in JSW and timing is very critical indeed. Personally I found it easier to play from the keyboard rather than joystick — all the usual options for these are included.

I loved the sneaky digs at other programs, the set of '"Hunchback" type screens for instance. Definitely a classic that every Spectrum owner who enjoys playing games should have!

I hope that Matthew's fertile mind gives this theme a rest now as I'm sure he can create another whole new generation of games, given the chance.

Les Flics — PSS

More confusion for the overheated brainbox!

PSS tell you the aim of the game, to find and pinch the Purple Puma Diamond by controlling the "Pink character". I seem to recall a similar theme in a series of films!

The problem is they don't tell you how!

First you start driving a pink motor around a set of streets avoiding the police cars, there are nine different buildings which you can't visit. Once you enter one of these buildings then you become a large animated panther, a-la cartoon.

There are eight other items to collect and use, each has a purpose but you only find out by trial and error. Also in these buildings are various characters like PC Kaolin (disguised as a chef) and Inspector Cleudeau.

The intro is amusing but the gameplay is quite serious — Peter Sellars would have been quite upset not having a banana skin to slip on!

Good graphics, fair sound and an enjoyable and challenging game. I found no appreciable advantage by using a joystick, only Kempston is provided although the keyboard game will operate with the cursor mapped variety — AGF/Protek etc. Awkwardly, they provide two recordings, one on each side of the tape, for keyboard or Kempston rather than an option from within the program.

Jack and the Beanstalk Thor

Superb cartoon graphics, the old Spectrum really can do some impressive things.

Currah Speech is used quite a lot and very effectively in this game. Some words need a bit of electronic translation, but it is an added extra dimension.

Joystick control is provided although I couldn't find a jump feature while using it — it's probably there, but the instructions don't give any clues and without it the game is near impossible. The keybaord layout is very good and I preferred to use this system.



Great presentation of the story in a scrolling redefined character set.

Colour and sound are used well and the action is fast and furious, again you have to find your way around by experimenting and I found this a little illogical. For instance on the first screen there is an axe. Now, going by the story, the axe is used at the end to chop down the beanstalk so shouldn't be required just yet. In fact you cannot successfuly climb the beanstalk until you have picked it up! Still this is a minor quibble about what is an excellent game. I also found that movement needed a bit of practice to get used to as Jack is very sensitive to the keys and often overshot the area I was intending him to visit!

USA users!!!

A quickie bit of info, you can now use all the UK Spectrum software on your TS2068!!

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By buying a Spectrum Emulator cartridge from the Triangle Sinclair Users Group, c/o Douglas Dewey, 205 James St., Carrboro NC 27510 for $60.00.

Meanwhile I have it on good authority that JSW and Manic Miner will work if you simply load in the code part of the prog. and RANDOMISE USR "start".

"start" is a number which can be found by MERGE-ing the first bit of the prog. and writing down the number which they use in the same command.

Review Preview

Just to be on the ball, as they say, Durrel Software should by now have released COMBAT LYNX. I saw some screens from the pre-production tape and freaked out!

You fly an on screen chopper over a terrain which must be the most detailed landscape produced on a Speccy so far. Loads of options covering mission, weapons etc. (they researched the abilities of the Lynx with cooperation from the makers!)

I forecast that this will be another number one for them and look forward to reviewing the final version. This batch of tapes has been low on the old Zap-factor!

Ratings

Just a note on my rating system. I've said most things worth saying in the review so the ratings summarise these and are in three sections.

1. **Presentation** which covers instructions, graphics insert etc.
2. **Zapability** which rates the addictive factor and playability.
3. **Overall** which is the final, overall assessment. (Up to 5 ★)

Sabre Wulf
Ultimate, Play the game
The Green
Ashby de La Zouch
Leics. LE6 5JU
£9.95
PRESENTATION 95%
ZAPABILITY 100%
OVERALL ★★★★★

TLL
Vortex Software
280 Brooklands Rd.
Manchester M23 9HD
£5.95
PRESENTATION 80%
ZAPABILITY 82%
OVERALL ★★★★

Rapscallion
Bug Byte Ltd.
Mulberry House
Canning Place
Liverpool
£6.95
PRESENTATION 85%
ZAPABILITY 93%
OVERALL ★★★★

Jack and the Beanstalk
Thor (Computer Software) Co. Ltd.
Erskine Ind. Est.
Liverpool L6 1AP
£5.95
PRESENTATION 90%
ZAPABILITY 96%
OVERALL ★★★★★

Jet Set Willy
Software Projects Ltd.
Bear Brand Complex
Allerton Rd.
Woolton
Liverpool L25 7SF
£5.95
PRESENTATION 92%
ZAPABILITY 100%
OVERALL ★★★★★

Les Flics
PSS
452 Stoney Stanton Rd.
Coventry CV6 5DG
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PRESENTATION 89%
ZAPABILITY 84%
OVERALL ★★★★

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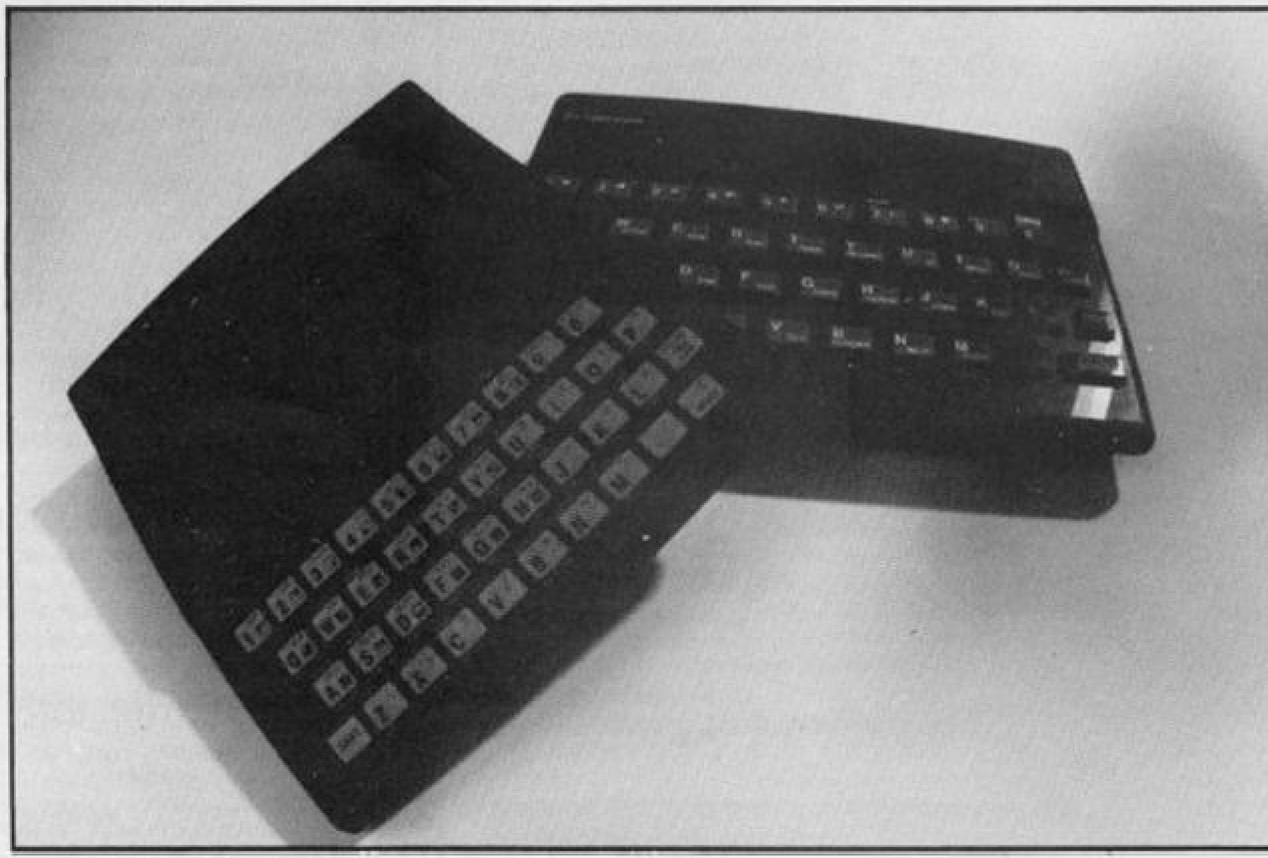
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De-bugger

Getting a program typed in is often only the start of your problems. Ed to the rescue.



Typing in a program is a useful exercise. Apart from the patience required, techniques learned and the end program to be used, probably the most educational part of it is tracking down the bugs introduced by yourself or occasionally by our publication system.

In debugging you gain a much deeper insight and understanding on how the program actually works than by merely typing it in, but tracking down these errors is an art in itself and needs some skill. So here are some tips to help you in your efforts when faced with that cryptic error report!

1 NEXT without FOR
Look back through the program, either the loop has not been set up — no related FOR 'letter' = No1 TO No2 line, or the letter has been re-used as an ordinary variable within the loop with a LET 'letter' = No.

2 Variable not found
This is one of the most common errors. Again, the problem may not lie in the line where the error was detected and reported. If there is only one variable, which may be one or more letters or a string ($) variable, then that is the problem. There may be more than one variable in the line section reported and you will have to identify the offending one. In a line PRINT AT Y,X;A$ the culprit could be Y or X or A$. To find out which of them is causing the problem (it may be more than one) type in turn as a direct command:

PRINT Y Enter/Newline
PRINT X Enter/Newline
PRINT A$ Enter/Newline

Note which produces the error report. Now look back through the program printout for the line which sets it up — usually a LET or FOR command. Did you leave it out? Does the program get there or has a GOTO/GOSUB been wrongly addressed?

3 Subscript wrong
Connected with DIM A(No) or DIM A$(No). If the number in the brackets on the line where the error is reported is greater than the one in the original DIM statement, is not an integer or is less than 1, then this report is generated. If the subscript — number in brackets — is a number then check and change, however, if it is a variable then follow the procedure for tracing variables. It has probably exceeded the limits, look for lines with the variable being altered with + − * / : if necessary add limiting code. For example:

IF X >10 THEN LET X = 10

4 Out of memory
As well as for programs which are too big, it may happen if the previous program set RAMtop. Before despairing, enter CLEAR USR "a"-1 on the Spectrum: on the ZX81 SAVE the program, turn the machine off and on, then reload the program.

7 RETURN without GOSUB
Somehow the computer has reached a RETURN command other than via a GOSUB instruction. Check a GOTO hasn't been entered in place of a GOSUB. Check for a missing GOSUB.

B Integer out of range
An integer (whole number) either as a number of variable is too big or small and you are attempting to do something like PRINT AT 0,33 — not allowed! Check any variables involved as per report 2 and trace it back through the program looking for adjustments to it by + − * / : Add limiting code if needed — see report 3

E Out of DATA
A Spectrum problem. Check the number of DATA items match the number of READs; usually one (or more) has been missed out. Attempting to reread a DATA list without first using a RESTORE command will cause this and it can happen on an auto start program (saved with a LINE number). Good programming usually RESTOREs to the correct line number before using READ.

I FOR without NEXT
See report 1 but this time the NEXT is missing!

Note that the letters I have used for examples could by ANY letters not just A$,X,Y etc and depend on the particular choice of the programmer.

This is by no means a comprehensive list but I have tried to cover many of the most common error reports. Personally, I get almost as much satisfaction from debugging as I do from programming I do assure you, however, that there is absolutely no truth in the rumour that we deliberately inject bugs into our listings in order to introduce you to the dubious delights of debugging!



RAINBOW ELECTRONICS

Conversion tips

A guide to ZX81/Spectrum program conversions from David Nowotnik.

The versions of BASIC offered by the two ZX computers are so similar that many programs for one can be used by the other. The ZX81 has only two commands which are not present on the Spectrum, SCROLL and UNPLOT, and these should cause you few problems when converting ZX81 programs to the Spectrum (see Table 1).

There are quite a lot of commands and functions on the Spectrum which are not available on the ZX81. A list of these appears in Table 4. The stars indicate those commands and functions for which there is no simple translation to ZX81 BASIC. Those for colour and sound can be ommitted; but you will have to find some alternative for the high resolution and file I/O commands.

The command PLOT appears on both computers, but the effect is quite different, so beware! Another tip: PEEK and POKE should be used with caution. In conversion, addresses will almost certainly have to be changed. Some of those changes appear in the tables. A command such as POKE USR "a" . . . . on the Spectrum indicates User Defined Graphics; ZX81 users don't have this facility, so you'll have to omit this and use a standard character instead.

ZX81	Spectrum	Comments
SCROLL	RANDOMISE USR 3582 or LET t=USR 3582	If the program uses random numbers, they could become rather predictable with the first option. If so, use the second, using a variable (in this case t) which is otherwise not used.
PLOT Y,X	PRINT AT 21−Y/2,X/2;	Print the appropriate quarter square graphics character.
UNPLOT Y,X	PRINT AT 21−Y/2,X/2;	Print a space, or the appropriate quarter square graphics character.

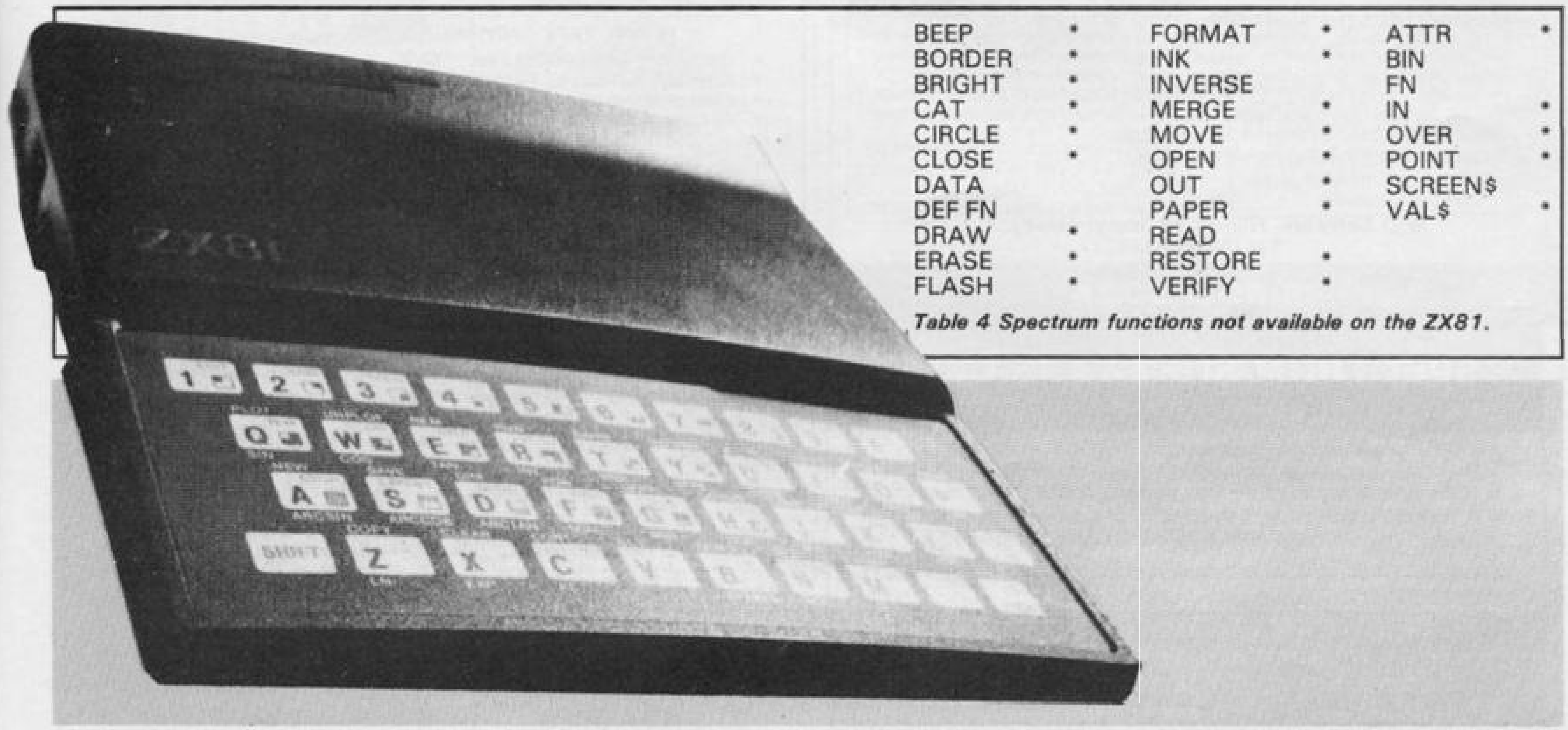
Table 1 ZX81 to Spectrum conversions.

Spectrum	ZX81	Comments
BIN eg LET y=BIN 10010101	LET y=(decimal no.) Conversion to decimal: 10010101=149 128 64 32 16 8 4 2 1 Add these numbers together when a 1 appears at the appropriate position in binary.	BIN allows the representation of a number in binary. On the ZX81 use the decimal equivalent, but beware; BIN is often used with User Defined Graphics, which are not available on the ZX81.
READ/DATA eg READ x,y DATA 50,60	LET LET X=50 LET Y=60	READ and DATA are used to store a lot of information in a program. Use LET instead.
DEF FN and FN eg DEF a(x)=SQR x LET t=FN a(i)	LET X$="SQR X" LET X=I LET T= VAL X$	The defined function can appear in a string. Use the keyword for built-in functions (eg SQR). The equivalent of FN may need 2 lines, as shown.
PLOT	no equivalent	
SCREEN$ eg LET a=SCREEN$ x,y	LET A=PEEK(PEEK 16396 +256*PEEK 16397+1+Y+33*X)	Used in interactive games to detect characters in the display file. Note — this formula only works when a RAM pack is fitted.

Table 2 Spectrum to ZX81 conversions.

ZX81	Spectrum	Comments
1 FRAMES POKE 16436,255 POKE 16437,255 LET T=(65535 – PEEK 16436 – 256*PEEK 16437) /50	POKE 23672,0:POKE 23673,0 LET t=(PEEK 23672+256* PEEK 23673)/50 For times greater than 10 minutes, you can use byte 23674 as well.	Both computers have a counter which accurately varies by 50 every second. In the example, use the first line to start the 'clock'. The variable T will have the time in seconds after the start. The counter can only be used for 10 minutes.
2 Line number zero POKE 16510,0	POKE 23756,0 (As the start of BASIC can move, eg with microdrives) use with caution.	Converts the first line of a program to line number zero, which cannot be edited, and so is protected.
3 RAMTOP POKE 16388,X – 256*INT (X/256) POKE 16389,.INT (X/256)	CLEAR x	Creates a safe area at the top of RAM starting at address x, for storing data, machine code etc.

Table 3 General interconversion hints.



BEEP	*	FORMAT	*	ATTR	*
BORDER	*	INK	*	BIN	
BRIGHT	*	INVERSE		FN	
CAT	*	MERGE	*	IN	*
CIRCLE	*	MOVE	*	OVER	*
CLOSE	*	OPEN	*	POINT	*
DATA		OUT	*	SCREEN$	
DEF FN		PAPER	*	VAL$	*
DRAW	*	READ			
ERASE	*	RESTORE	*		
FLASH	*	VERIFY	*		

Table 4 Spectrum functions not available on the ZX81.

System Variables Conversion Table.

Variable	ZX81/ T/S1000	Spectrum/ TS2068
BREG	16414	23655
CDFLAG	16443	No Equivalent
CH ADD	16406	23645
COORDS	16438	23677
COORDS (Byte 2)	16439	23678
DEST	16402	23629
DF CC	16398	23684
D FILE	16396	No Equivalent
DF SZ	16418	23659
E LINE	16404	23641
ERR NR	16384	23610
E PPC	16294	23625
ERR SP	16386	23613
FLAGS	16385	23611
FLAGX	16429	23665
FRAMES	16436	23672
LAST K	16421	23560
MARGIN	16424	No Equivalent
MEM	16415	23656
MEMBOTT	16477	23698
MODE	16390	23617
NXTLIN	16425	23637
OLDPCC	16427	23662
PPC	16391	23621
PRBUFF	16444	23296
PR CC	16440	23680
RAMTOP	16388	23730
SEED	16434	23670
S PSN	16441	23688
S POSN (Byte 2)	16442	23689
STKBOT	16410	23651
STKEND	16412	23653
S TOP	16419	23660
STRLEN	16430	23666
T-ADDR	16432	23668
VARS	16400	23627
VERSN	16393	No Equivalent
X PTR	16408	23647

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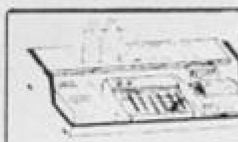
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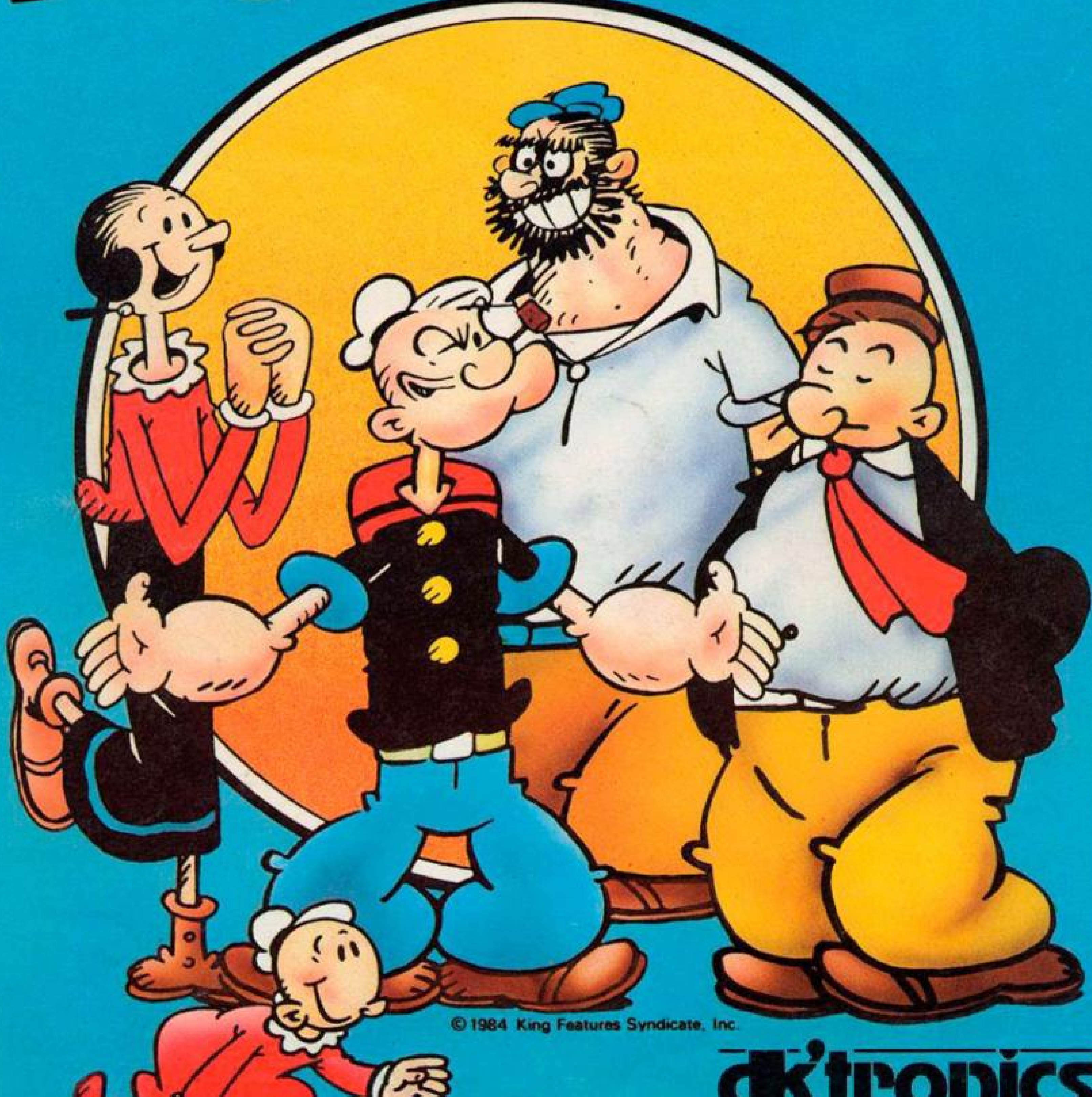
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